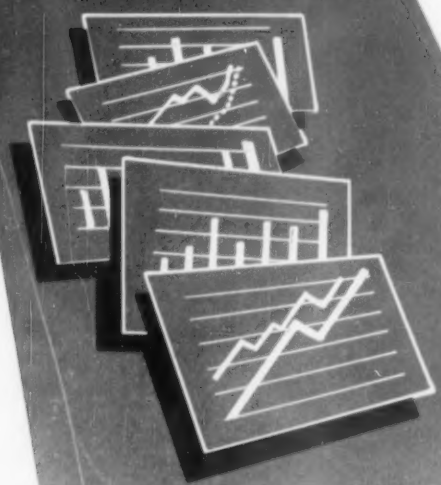
the OIL AND GAS JOURNAL



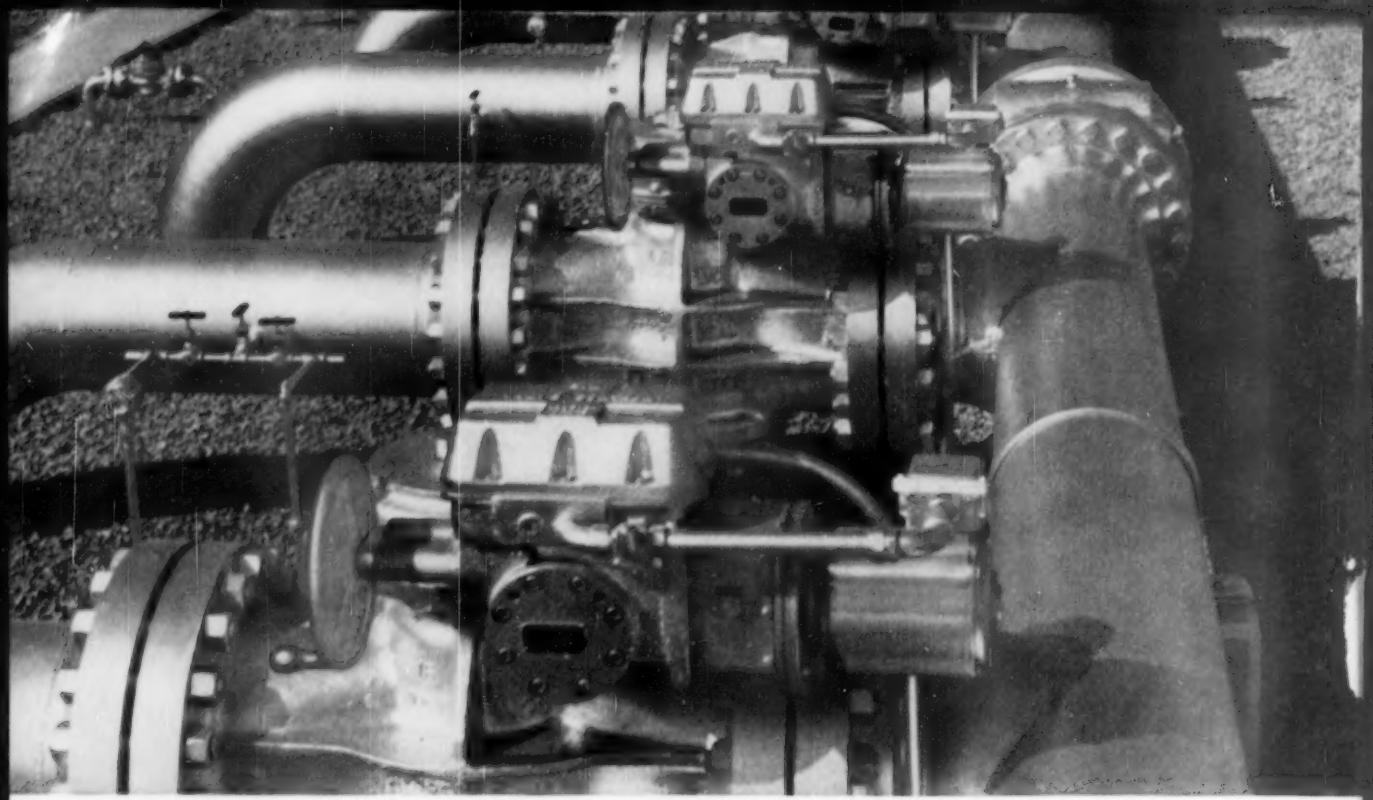
JULY 25, 1955

MIDYEAR REPORT

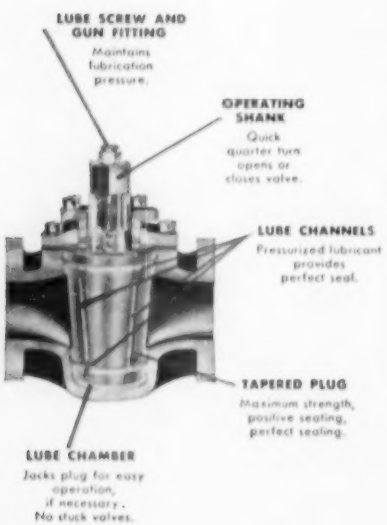
A good first half is behind us . . .
How does the second shape up?

Report: Engineering at Midyear . . .
Forty pages of technical developments

Will 1955 oil imports be "significantly" excessive? • p. 126



Better Production Control... at LOWER COST with **Rockwell-Nordstrom Valves**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Maintains lubrication pressure.
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LUBE CHANNELS
Pressurized lubricant provides perfect seal.
TAPERED PLUG
Maximum strength, positive seating, perfect sealing.
LUBE CHAMBER
Jacks plug for easy operation, if necessary. No stuck valves.

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Canadian Valve Licensee: Peacock Brothers Limited.

ROCKWELL-Nordstrom VALVES

LUBRICANT SEALED FOR POSITIVE SHUT-OFF

PAGE 1 ONE . . . *a glance ahead*

Jet bit which erodes through hard rock hydraulically with small assist from mechanical chisel action is getting laboratory study as one means of applying power at bottom of drilling well. All-jet drilling would require big increase in mud-pump power but might give compensating increase in penetration rate.

Don't look for definite action on Canada-U. S. gas exchange before fall. Canadian government is most reluctant to abandon all-Canadian service to eastern provinces or to authorize big exports to U. S. Midwest, is still studying alternatives, including routes partly through U. S. but with no big export sales west of Niagara.

Butyl rubber, now in private hands and fast losing its market for inner tubes, is out to find new uses. Current research indicates it will provide stiff competition for other rubbers in tire casings, hose, belting, shock absorbers, mechanical rubber goods.

A new geophysical technique which picks up high-frequency energy can map shallow structures from a few hundred feet down to 8,000 ft. It has proved successful along flanks of Oklahoma's Arbuckles and is now being studied for use on complexly folded and faulted belts such as Rocky Mountain and Canadian foothills.

Exploration interest in the Rocky Mountain region is perking up after a lull of several months. Areas to watch during near future include southeastern Colorado, Chadron arch in western Nebraska, north central North Dakota, central Montana plains, disturbed belt of northwestern Montana, and area between Pembina and Sturgeon Lake in Alberta.

Water-flood research indicates that oil recovery can be stepped up importantly by water-miscible agents, such as alcohols, that will form a moving front between the oil phase and the main body of flood water. Studies are now centering on whether the increased displacement efficiency will more than pay the cost of the agents.

The OIL AND GAS JOURNAL

JULY 25, 1955 • VOLUME 54 • NUMBER 12

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OIL AT MIDYEAR

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Petroleum had the best all-around half-year in history. More records will be set in last half.

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Wildcat drilling will increase at a faster pace than development work with new records set for both.

First-Half Drilling Gained 6.9 Per Cent 150
Drillers cut 110,208,000 ft. of hole in first half, completing 27,696 wells.

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Crude for Storage Helped Production 154
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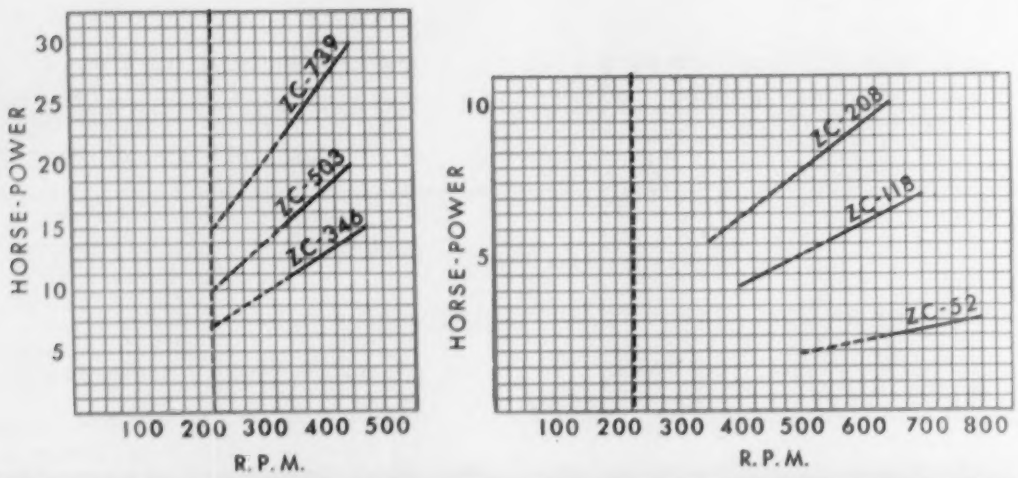

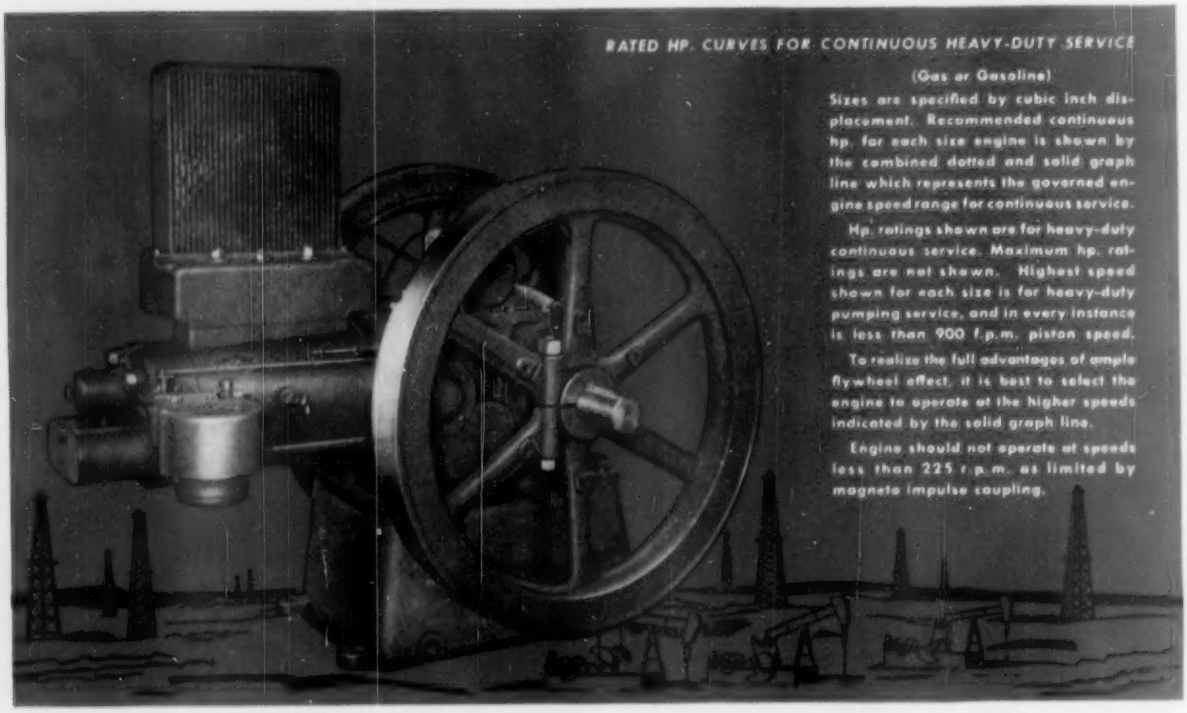

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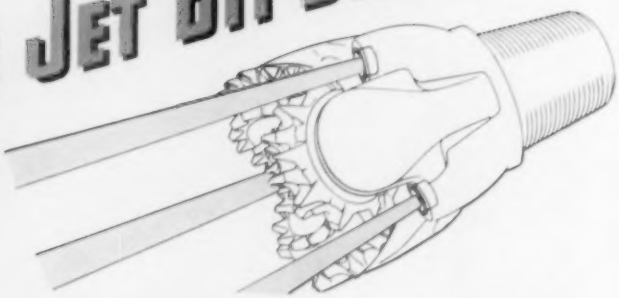
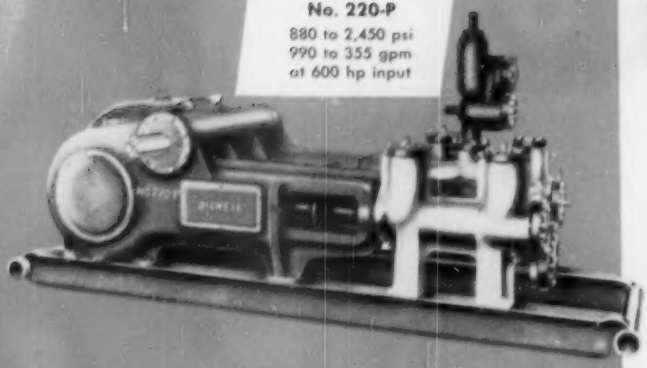
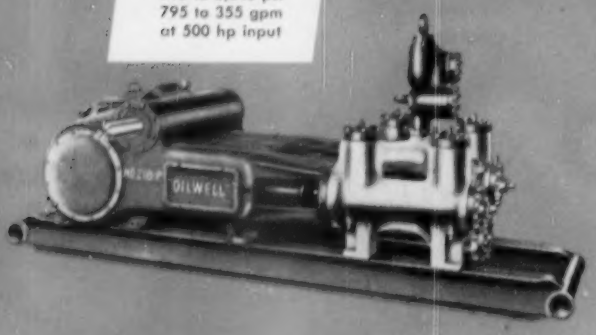


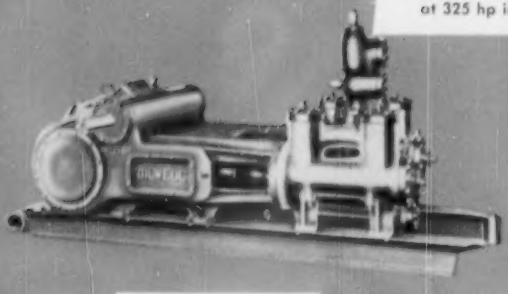
No. 220-P
880 to 2,450 psi
990 to 355 gpm
at 600 hp input



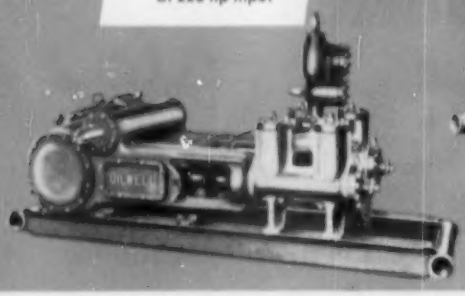
No. 218-P
915 to 2,040 psi
795 to 355 gpm
at 500 hp input

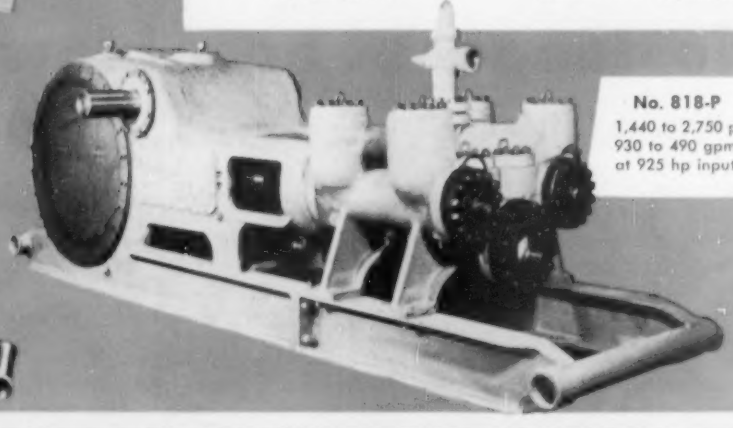


No. 214-P
765 to 1,375 psi
620 to 345 gpm
at 325 hp input



No. 212-P
550 to 1,200 psi
580 to 265 gpm
at 220 hp input





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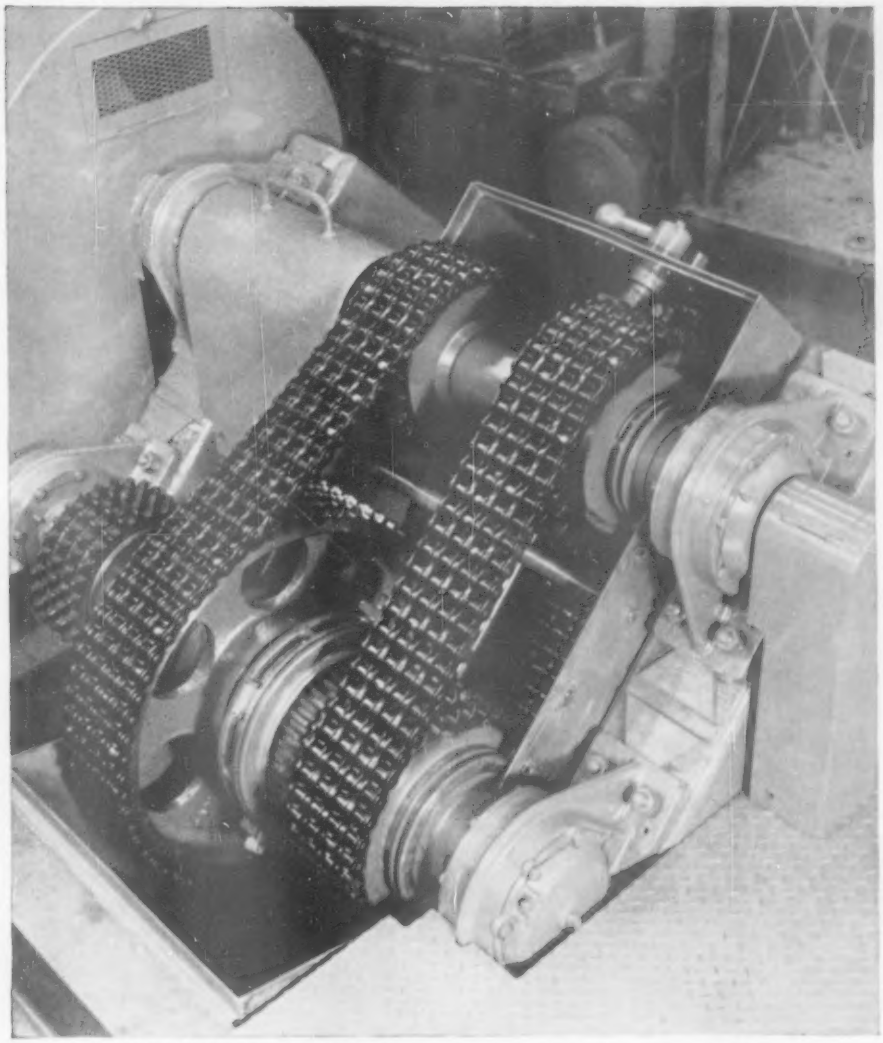

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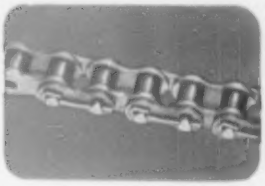

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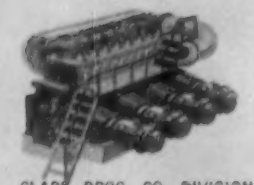

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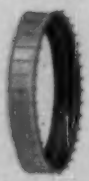

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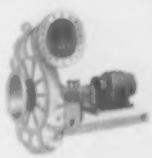
ROOTS CONNERSVILLE



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SEISMIC GRAVITY MAGNETIC SURVEYS

Forgotten fan never rests, never protests

. . . its shafts are on TIMKEN® bearings

THIS fan runs 24 hours a day, day-after-day, in a power plant's cooling tower. It practically never gets attention, or needs it. The Lufkin Foundry & Machine Company, Lufkin, Texas, mounted its drive pinion and fan shaft on Timken® tapered roller bearings.

Timken bearings prevent shaft misalignment that hastens gear wear. They hold both shafts in positive alignment because their tapered construction enables them to handle any combination of radial and thrust loads. And full line contact between rollers and races gives Timken bearings load-carrying capacity to spare.

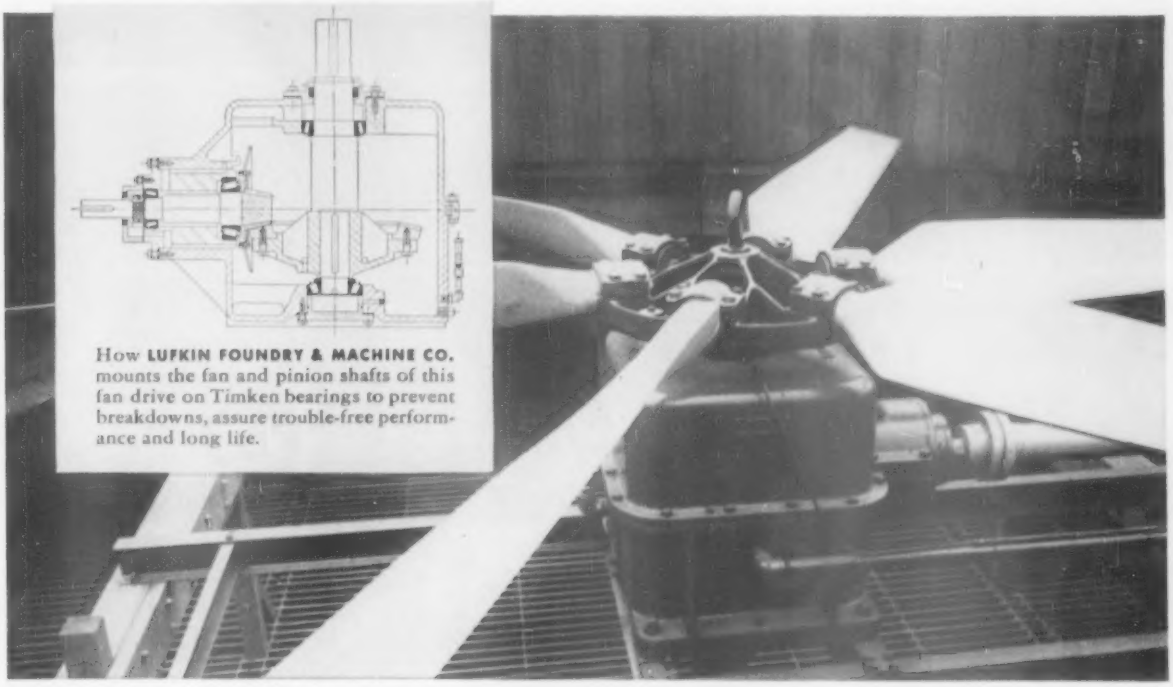
Exposed as the fan is to all kinds of weather, you might think that rain could affect the Timken bearings. It doesn't. Timken bearings make closures more effective because they keep housings and shafts concentric. Rain or dirt can't get in—lubricant can't get out.

Wear is virtually eliminated because Timken bearings practically eliminate friction. That's because they're designed to roll true; and because they're made with microscopic accuracy to conform to their design. And you're doubly assured of Timken bearings' quality because we make our own steel. No other U. S. bearing manufacturer does.

To get these advantages in the equipment you build or buy, always look for the trade-mark "Timken" stamped on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.

How **LUFKIN FOUNDRY & MACHINE CO.** mounts the fan and pinion shafts of this fan drive on Timken bearings to prevent breakdowns, assure trouble-free performance and long life.



TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

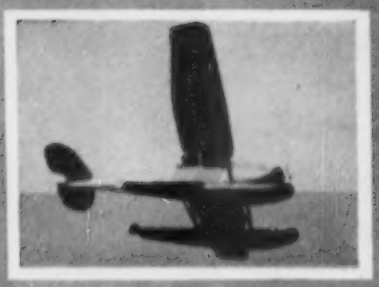
DESIGN LEADERSHIP

The first Timken tapered roller bearing was produced in 1898. Since then the one-piece multiple perforated cage, wide area contact between roller ends and ribs, and every other important tapered roller bearing improvement have been introduced by The Timken Roller Bearing Company.

Only Timken tapered roller bearings have these advantages: 1. advanced design; 2. precision manufacture; 3. rigid quality control; 4. nickel-rich Timken alloy steels.

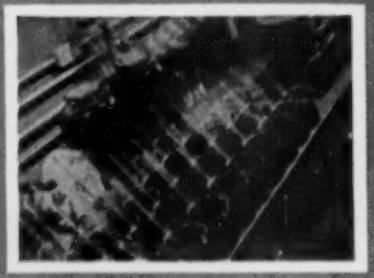
NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ↓ AND THRUST →| LOADS OR ANY COMBINATION ✳

8 reasons why Tretolite offers superior SERVICE

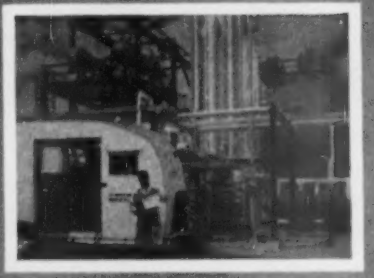


1 *Facilities to insure prompt service*

2 *Superior manufacturing equipment*



3 *Continuing research and development*



4 *On-the-job development program*

5 *Adequate stocks, conveniently located*

6 *Offices or engineers located in all petroleum areas*

7 *Expert, experienced service personnel*

8 *A variety of helpful products and services*

DEMULSIFYING
DESALTING
WATER CLARIFICATION
CORROSION PREVENTION
PRODUCTIVITY IMPROVEMENT
PARAFFIN REMOVAL
SCALE PREVENTION
BACTERICIDES

For complete information on any Tretolite Company product or service, call your Tretolite engineer or write to

TRETOLITE COMPANY

DIVISION OF PETROLITE CORPORATION

[illegible], St. Louis 16, Missouri
[illegible], East Los Angeles 22, California

TRETOLITE COMPANY
Tret-O-litE
SAINT LOUIS LOS ANGELES

APS

LONGER LINING LIFE

with Eaton Self-Contained Air Brakes

In exhaustive tests and actual truck operation, the Eaton self-contained air brake has proved that lining life is increased as much as 100 per cent. When necessary, relining service time is greatly reduced, cutting labor as much as two to four hours.

These important advantages are the result of a combination of Eaton advancements. Floating split-shoe design—using single pins at the anchor ends, with rollers and floating pins at the cam ends of the shoes—eliminates the need for anchor-pin lubrication, makes for quick action and quick release, and prevents pin seizure. Simply constructed with fewer parts, over-all weight is reduced approximately 15 per cent.

For a given input, greater braking effort is delivered at the drum. The strong rigid chamber bracket, mounted directly on the brake spider, entirely supports the short camshaft. Lubrication of the shaft is provided by a reservoir contained in the bracket. This compact, close-coupled design, with reduced bracket deflection, reduced camshaft wind-up, and shorter chamber stroke, assures quicker, safer truck stops.

PLUS

GREATER BRAKING EFFICIENCY

•

QUICKER ACTION

•

QUICKER RELEASE

•

QUICK, EASY RELINE

EATON

AXLE DIVISION

MANUFACTURING COMPANY

CLEVELAND, OHIO

PRODUCTS: Sodium Cooled, Poppet, and Free Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Rotor Pumps • Motor Truck Axles • Permanent Mold Gray Iron Castings • Heater-Defroster Units • Snap Rings Springtites • Spring Washers • Cold Drawn Steel • Stampings • Leaf and Coil Springs • Dynamatic Drives, Brakes, Dynamometers

Bethlehem High-Strength Gas Pipe Resists Fatigue—Welds Easily

Bethlehem High-Strength Gas Pipe is recommended for pipe-line compressor stations and other locations where severe vibrations or extremely high pressures are encountered.

This pipe is fabricated from as-rolled plates of Mayari R, Bethlehem's high-strength low-alloy steel. Mayari R has a yield point of 50,000 psi min, an endurance limit of approximately 50,000 psi, high corrosion resistance and excellent workability and weldability.

RESISTANCE TO FATIGUE—Mayari R steel's endurance limit is unusually high—about 50,000 psi (60 to 75 pct of its tensile strength of 70,000 psi minimum). In addition, Mayari R steel is extremely ductile, with 22 pct minimum elongation in 2 in. Pipe fabricated from Mayari R plate has the exceptional endurance strength, extreme ductility and high impact qualities needed for handling vibration, pulsation and variable shock-loadings.

LIGHTER WALLS—When you use Bethlehem High-Strength Gas Pipe you can specify much lighter walls than with ordinary carbon-steel pipe. This results in savings in material, as well as in the cost of transportation, handling and field welding.

WELDS READILY—Bethlehem High-Strength Gas Pipe is readily welded by following normal field-welding procedures, using mild steel electrodes.

FOR NORMAL PIPELINE SERVICE we recommend Bethlehem Gas Pipe fabricated from carbon steel, meeting specifications ASTM A134 or API 5LX42. Comparative weights and test pressures for these grades of pipe, as well as for pipe made from Mayari R, are shown in the table below.

All grades of Bethlehem Gas Pipe are made in 40-ft lengths, with beveled or square ends, and in all diameters from 18 in. OD. We can grit-blast, prime, coal-tar enamel and wrap the pipe to your specifications.

A phone call or letter to the nearest Bethlehem sales office will bring you full information about Bethlehem Gas Pipe, in Mayari R or carbon-steel grades.

Comparative Maximum Test Pressure: MAYARI R, API 5LX42 and ASTM A134 Steel Pipe

Pipe OD in.	¼ IN. THICK				⅜ IN. THICK				½ IN. THICK				¾ IN. THICK				1 IN. THICK			
	Wt lb per ft	Test Pressure psi Mayari R	API 5Lx42	ASTM A134*	Wt lb per ft	Test Pressure psi Mayari R	API 5Lx42	ASTM A134*	Wt lb per ft	Test Pressure psi Mayari R	API 5Lx42	ASTM A134*	Wt lb per ft	Test Pressure psi Mayari R	API 5Lx42	ASTM A134*	Wt lb per ft	Test Pressure psi Mayari R	API 5Lx42	ASTM A134*
18	49	1180	990	665	73	1770	1490	960	96	2360	1985	1275								
20	54	1120	920	575	81	1590	1340	860	107	2130	1785	1150								
22	63	965	820	520	93	1450	1220	815	118	1935	1630	1040								
24	67	885	750	475	99	1330	1120	745	130	1770	1490	955								
26	73	820	690	440	107	1225	1030	690	141	1635	1380	880	202	2450	2050	1325				
28	79	760	640	405	117	1140	955	640	153	1515	1275	820	219	2270	1910	1225				
30	85	710	595	380	125	1060	895	600	164	1415	1190	765	235	2130	1785	1145				
32	92	665	560	355	134	1000	835	560	176	1325	1115	715	252	1990	1675	1075	330	2650	2230	1430
34	97	625	525	335	143	940	785	505	187	1250	1050	675	268	1875	1575	1010	352	2500	2100	1350
36	105	590	495	315	152	885	750	480	200	1180	980	635	285	1770	1490	950	374	2360	1980	1275
42	118	505	425	270	173	760	640	410	228	1010	850	545	334	1525	1275	815	440	2020	1700	1090
48	135	440	375	235	199	665	560	360	263	885	745	475	384	1325	1115	715	506	1770	1485	955
60	170	355	300	190	252	530	450	285	331	710	595	380	483	1060	890	570	638	1415	1190	765
72	210	295	250	160	306	440	375	240	403	590	497	320	582	885	740	475	770	1180	990	635
84	238	250	215	135	353	380	320	205	464	505	425	270	672	755	635	410	902	1010	850	545

*ASTM A283 Grade B, to be used when ordering to ASTM A134 Specification. If ASTM A283 Grade C is used instead, the test pressures may be increased by 11 pct. Pipe can be furnished in diameters intermediate to those shown above.

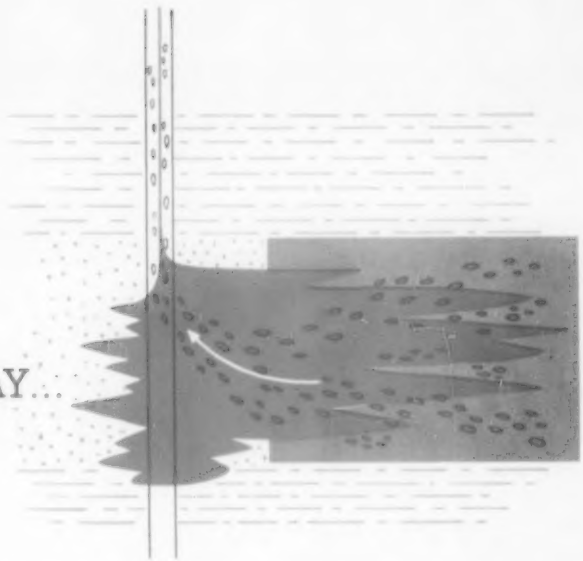
Test pressures above are based on stressing steel to 85 pct of minimum yield point
Mayari R—85 pct of yield point = 42500 psi
API 5LX42—85 pct of yield point = 35700 psi
ASTM A134—85 pct of yield point = 22950 psi
Formula used: $P = \frac{2ts}{D}$

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

EFFECTIVE
CLEANING
AGENT
CLEARS THE WAY FOR PAY...



HALLIBURTON'S *DOUBLE ACTION* MCA

With Halliburton's Mud Cleanout Agent, you get the *double action* needed to clear water-oil emulsions and water-mud blocks that shut off free flow of normal production. Combining hydrochloric acid and Halliburton's Morflo, HCl shrinks bentonite and attacks filter cake, then Morflo—a highly active surfactant—disperses shrunken bentonite particles, softens filter cake for easy removal in fluid suspension.

Results of MCA's use in the field are outstanding. Examples: one old well in the Refugio-Fox Field of Texas increased from zero to 30 BOPD after a 500-gallon MCA treatment. Output of another well, same treatment, went from zero to 80 BOPD. Still another old well, after a 100-gallon shot in the arm, climbed from 37 to 260 BOPD. These production boosts are routine when MCA is used after accurate analysis of the causes of plugged pay.

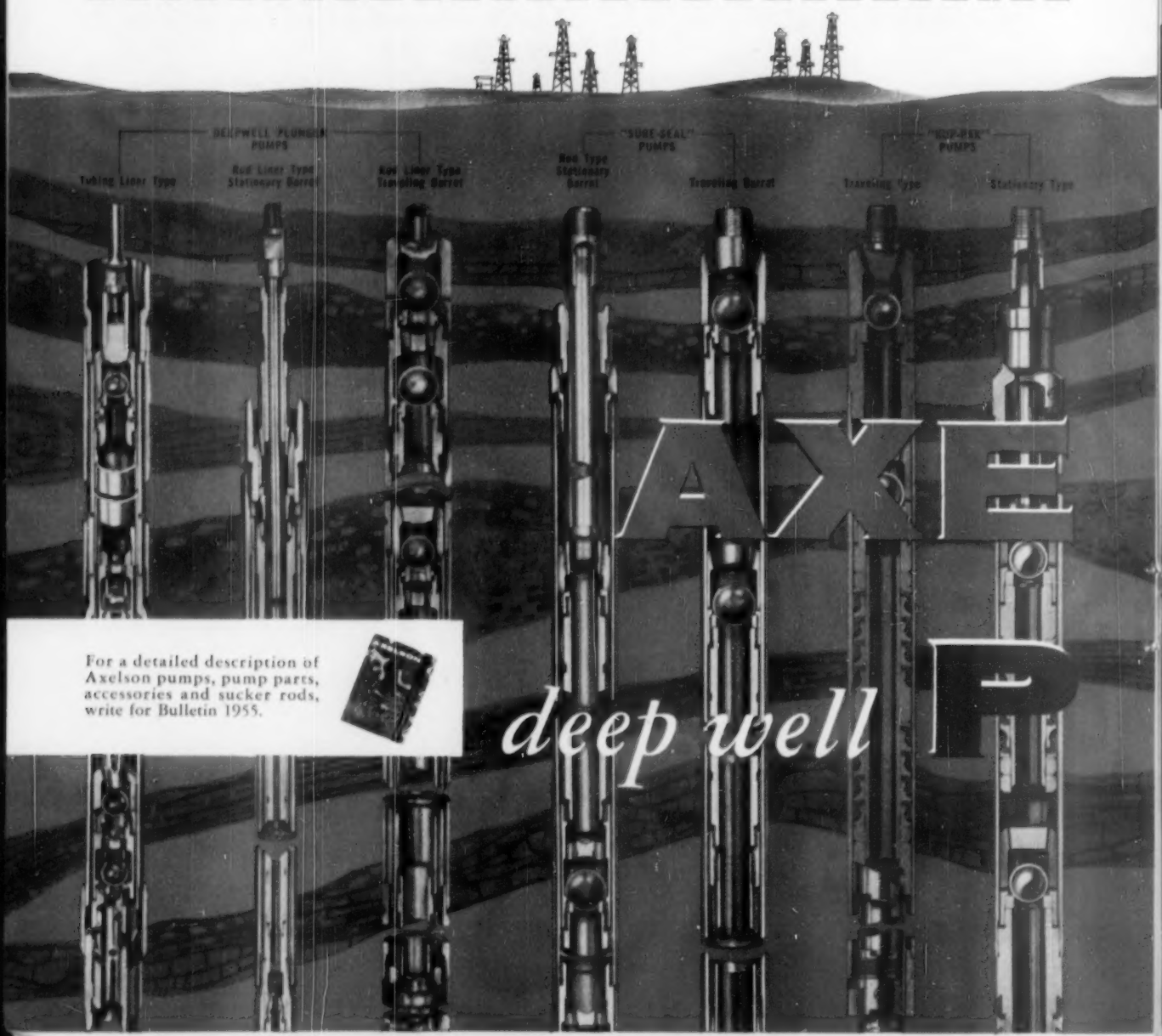
The double action of MCA can serve you well when completing a well, when reviving an old one, or when used prior to fracturing, squeezing or flooding. On both old and new wells, you'll find MCA to be a most effective cleaning agent to free blocked pay, improve production. For details, call your local or district office of the Halliburton Oil Well Cementing Company.

HALLIBURTON

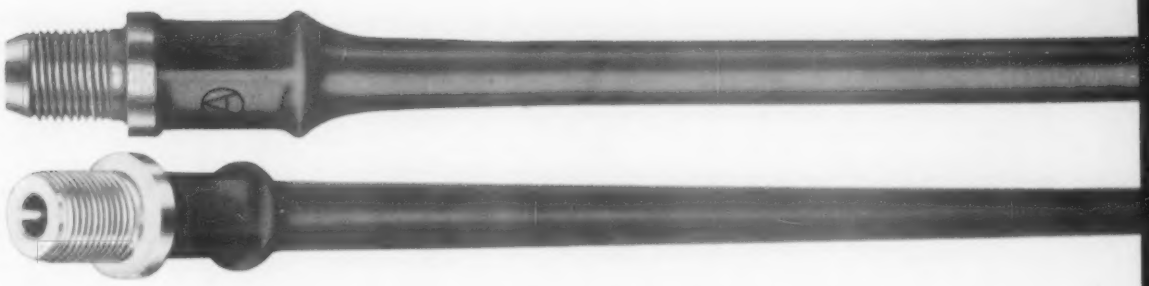
CHEMICAL SERVICES

211 SERVICE CENTERS—JUST MINUTES AWAY FROM ANY RIG

Custom tailoring
to your well condition
means longer pump life



For a detailed description of Axelson pumps, pump parts, accessories and sucker rods, write for Bulletin 1955.



It is important when ordering down well pumping equipment to know the conditions existing in the well bottom. Otherwise, the odds are definitely against the correct specifications of pump parts and sucker rods. That is why Axelson makes available a variety of pump types, a variety of pump parts, with design and metallurgy specifically aimed at efficient performance under any well condition. That is why Axelson has field experts readily available to operators for well analysis and assistance in proper equipment specification for trouble-free operation.

The same care applies to selection of the sucker rod string. And Axelson provides four grades that answer all conditions existing in operating wells. The Axelson HOL-O-ROD ® hollow sucker rod is in wide use as a special purpose rod. Call in that Axelson field expert to assure proper recommendation of both type and size of rods.

LSON
UMPS

AXELSON

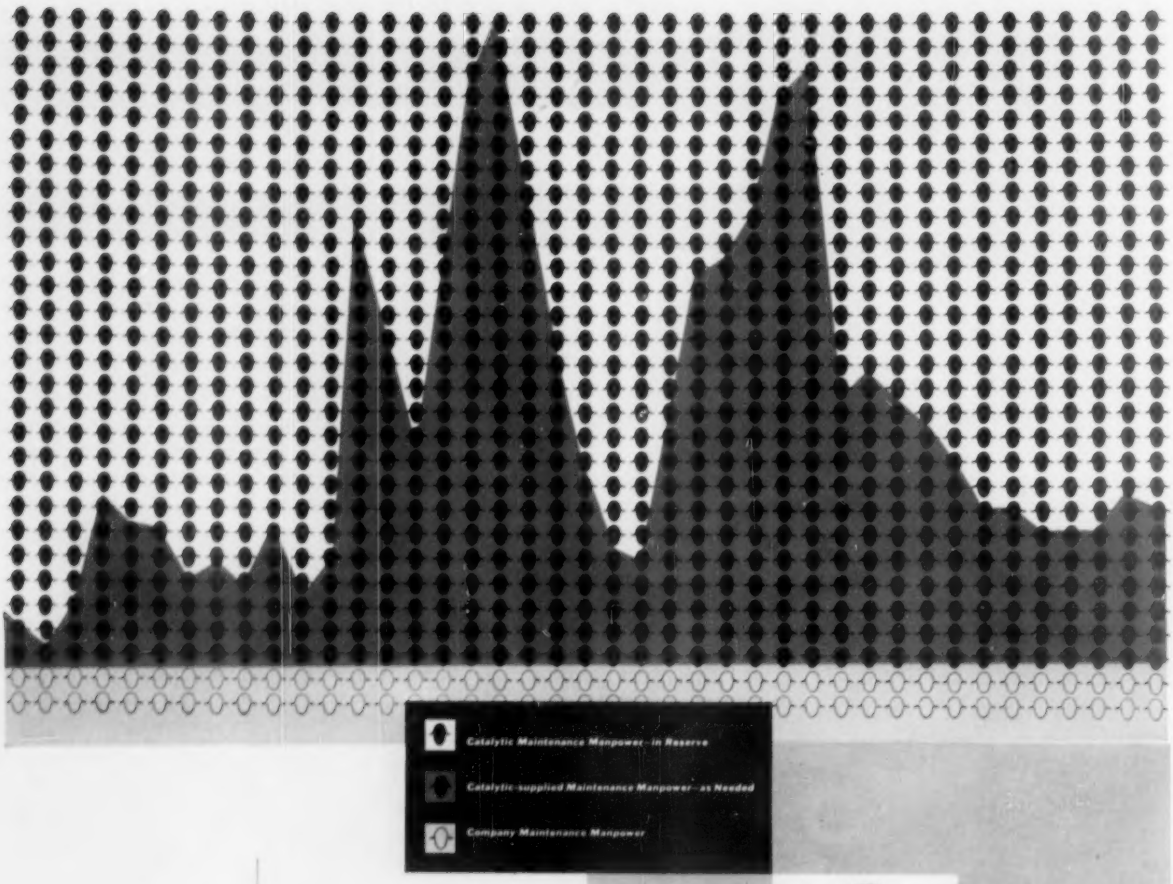
AXELSON
MANUFACTURING COMPANY

GENERAL OFFICES:
8160 S. BOYLE AVE., LOS ANGELES 58

DIVISION OF
U.S. INDUSTRIES, INC.

LOS ANGELES 58, NEW YORK 7,
ST. LOUIS 14, TULSA 1

Dealings (Sucker Rod Pumps) Supply Division, Great Northern Tool Co., Ltd., Jones & Laughlin Steel Sales Co., Ltd., Edmonton, Alberta, Canada; Dominion Oilfield Supply Co., Ltd., Calgary Alberta, Canada; Adrian Bolland & Cia., S.R.L., Buenos Aires, Argentina, S.A.; Gross Equipment S.A., Lima, Peru, S.A.; Industrial Agencies Ltd., San Fernando, Trinidad, B.W.I.; MAQUIP (Comercial de Maquinas e Equipamentos) S.A., Rio De Janeiro, Brazil, S.A.; Servicios Industriales, C.A., Barcelona, Venezuela, S.A.; Servicios Industriales, C.A., Maracaibo, Venezuela, S.A.; Wells Fargo & Co. Express, S.A., Mexico, D.F., Del Prado Maquinaria, Ltda., La Paz, Bolivia.



HOW HIGH IS your MAINTENANCE COST ?

This graph of the actual maintenance manpower load of an operating refinery demonstrates the value of *Catalytic's Maintenance Contract Service.*

Catalytic supplies experienced men, willing and able to do a *good day's work—as required* and *on time*—for normal operation, emergency or planned shutdown.

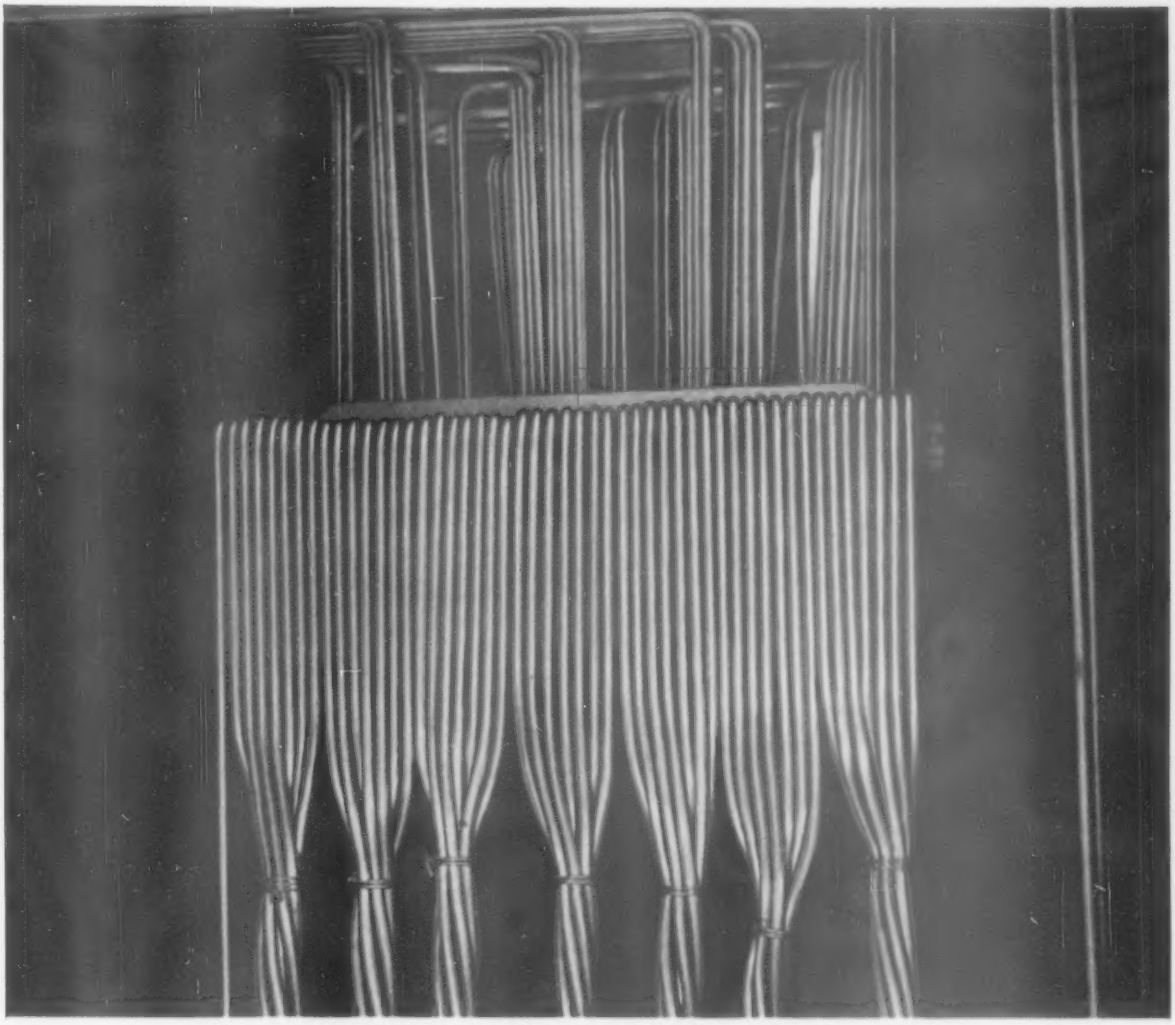
Our flexible service eliminates costly "made work" which often results from unavoidable valleys of maintenance requirements. Whatever the circumstances, Catalytic adds skilled supervision and manpower plus equipment—and works *as a team* with your regular crew.

The value of our service has consistently won repeat contracts. We suggest that you investigate the application and advantages of this plan to your operation—with an eye to higher productivity and lower maintenance cost.

CATALYTIC
CONSTRUCTION COMPANY
1528 Walnut Street, Philadelphia 2, Pennsylvania

In Canada:
Catalytic Construction of Canada, Ltd.; Sarnia, Ontario

CATALYTIC ON-TIME . . . ON-BUDGET SERVICES for the atomic energy, chemical, petrochemical and oil refining industries · Project Analysis · Process Design · Economic Studies · Engineering · Procurement · Construction · Plant Operation



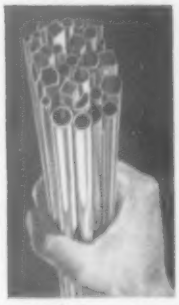
Cabled copper instrument tubing installed at Appalachian Electric Power Company's Kanawha River Station. You see it at the point where the cable divides for run-outs to instruments. Note smooth, short-radius bends.

108,000 feet of cabled copper instrument-control tubing helps keep Kanawha River Power Station humming

Hundreds of air-actuated instruments are an important part of the instrumentation control network at the 430,000-kw Kanawha River Station of the Appalachian Electric Power Company — part of the American Gas and Electric System. The size of the plant called for instrument tubing runs of up to 1,000 feet — with tubing cabled in bundles. For economical stranding, the tubing was needed in unusual lengths — without joints. To conserve space, small diameter tubing was needed. And ability to take short-radius bends without pinching was necessary.

The 108,000 feet of Anaconda Seamless Copper Tubing was supplied in 1,000-feet lengths. Outside diameter was only ¼-inch, wall thickness only .030". Shown above are typical tube bundles as they near terminal connections.

Anaconda small-bore, thin-wall tubing is available in lengths up to 2,400 feet. It comes in long coils on reels, or cut to your requirements. Capillary tubes, restrictor tubes, Bourdon tubes, special shapes, and fabricated tubes and parts for refrigeration and air-conditioning are available in many different alloys. These include phosphorized and OFHC copper, the full range of brasses, 3,003 aluminum, nickel silvers, and certain special alloys. For more information about Anaconda small-bore tubes and special shapes ask any district sales office, or write direct to *The American Brass Company, Waterbury 20, Connecticut.* In Canada: *Anaconda American Brass Ltd., New Toronto, Ontario.* 5378



Some of the many sizes and shapes of Anaconda Small-diameter Tubes.

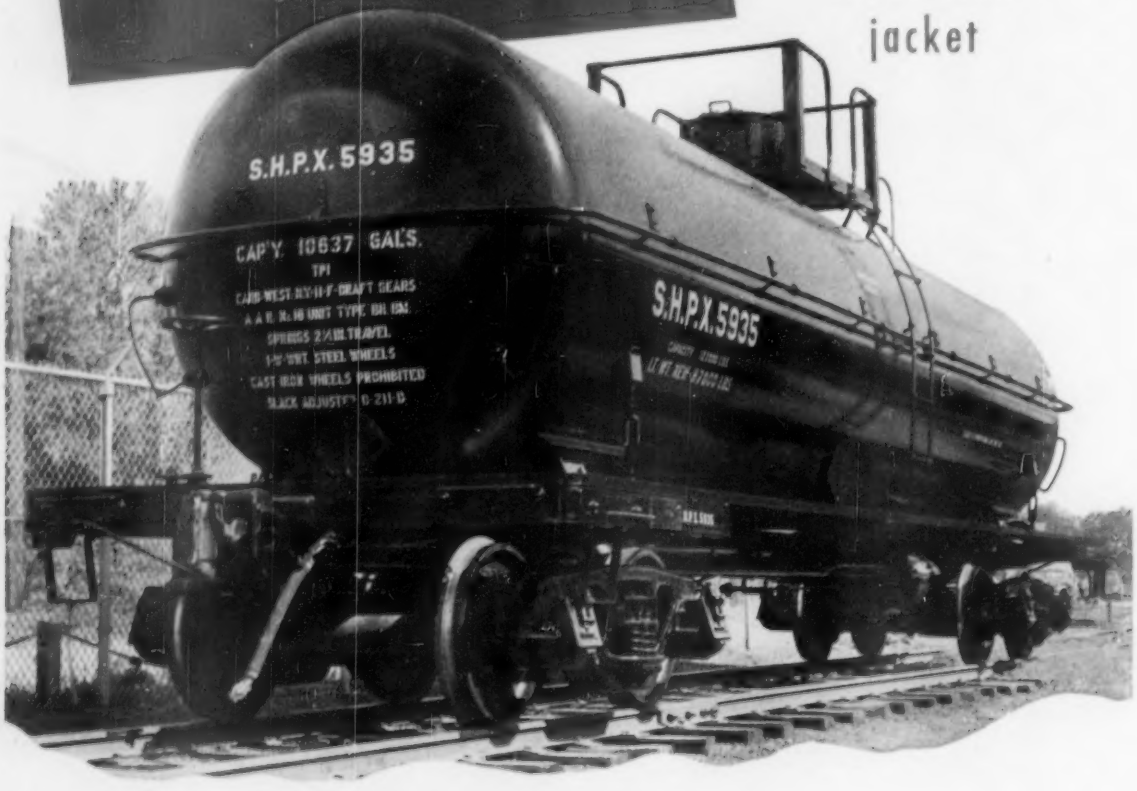
ANACONDA®
SMALL DIAMETER TUBES

PETROLEUM CHEMICALS DIVISION

When you specify **INSULATED** *tank cars, get the advantages of the new*

acf-BUILT DURADOME TANK CAR

all-welded heavy gauge insulation jacket



When insulation is required...insist on the new DURADOME insulation jacket with four important benefits...

- Duradome's insulation jacket is of heavier gauge steel...provides greater resistance to impact... assures a long, virtually maintenance-free life.
- All-welded construction does away with old-fashioned angles and bolts...greater corrosion resistance...streamlined...more weatherproof.
- One-piece ellipsoidal heads together with rigid spacers provide a contour-formed jacket...assure maximum efficiency through uniform insulation.
- Special ventilation device at bottom of jacket prevents accumulation of condensation . . . protects tank and insulation jacket from corrosion.

Whether you lease or buy, ask your Shippers' representative about the many *other* Duradome features . . . *flued dome . . . ring section construction . . . standardized underframe . . .* available on *all* standard Duradome tank cars at no extra cost.

Specialists for over 35 years in the leasing, operation, maintenance and servicing of tank car fleets—now exclusive sales agent of acf *tank cars for industry.*

SHIPPERS SHPX CAR LINE

Shippers' Car Line Corporation

A subsidiary of acf INDUSTRIES, Incorporated

30 Church Street, New York 7, N. Y.

CHICAGO, ILL. • HOUSTON, TEX. • SAN FRANCISCO, CAL. • MILTON, PA. • EAST ST. LOUIS, ILL. • SMACKOVER, ARK. • TULSA, OKLA. • NORTH KANSAS CITY, MO.

DU PONT REG. U.S. PAT. OFF.

PETROLEUM CHEMICALS DIVISION

NEWS

DU PONT REG. U.S. PAT. OFF.

July ★ *One of a Series of Interest to the Petroleum Industry* ★ *1955*

NEW TECHNICAL BOOKLET ON GREASE ADDITIVES

Du Pont "Ortholeum" 300 and Phenyl-alpha-Naphthylamine have long been effectively used for stabilizing greases. In the past, however, there has been little information published on the properties, uses, methods of addition and evaluation of these additives.

This information is now available to grease compounders in a new four-page booklet. To get a copy, just ask one of our representatives or regional offices for "Stabilizers for Grease."

Many Du Pont Films Available to the Petroleum Industry

Over 40 different 16 mm. movies, covering a wide range of subjects are readily available to you through the Du Pont Petroleum Chemicals Division.

Many of them were specifically designed and produced to help the oil industry promote its products and do a more comprehensive public relations job. Most recent of these is entitled "When the customer says 'KNOCK.'" It will give your dealers a quick, clear visual education on how to answer knock complaints in a salesmanlike way. Other full-color Du Pont films of particular interest to the industry include "What Makes a Gasoline Good," and "Pipeline on Wheels," which shows the public how petroleum products tank trucks are designed and operated for maximum highway safety.

To provide extra entertainment at dealer meetings and other gatherings, a library of Du Pont "Cavalcade of America" TV films is also available on loan. This series includes a documentary film on the famous Spindletop well.

Ask any of our representatives for more details on obtaining these films for your own use.

The service station operator is your most important link with the market

THE SERVICE STATION OPERATOR is generally an independent sort of fellow by nature. And he has his own opinions about customer credit, promotion, price wars, handling employees, and many other important aspects of service station operation.

What does he *really* think . . . and how can this affect your marketing program? A new Du Pont survey can help you answer these questions.

HOW MUCH does the average service station operator know about the quality features of the products he sells? The new Du Pont dealer survey can give you a realistic, unbiased answer.

The results of the new survey—entitled "The Service Station Operator"—are to be published in a series of five reports. The first report is already off the press and is now being distributed to oil company marketing executives. The other four reports will be issued periodically during the next twelve months.

Impartial

Sponsored by Du Pont, the survey was conducted on a completely impartial basis by National Analysts, Inc. It is nationwide in scope and part of the continuing market research work of the Du Pont Petroleum Chemicals Division. It follows the recent Du Pont survey of service station customer buying habits.

To meet industry need

The survey was initiated because it was widely felt that the oil industry had a real need for more information about their dealers and dealer operations. The questionnaire itself was prepared after discussion with oil company market research groups and members of the Marketing Research Committee of the American Petroleum

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

OVER

PETROLEUM CHEMICALS DIVISION
NEWS

CONTINUED *Dealer Survey*

Institute.

Using the scientifically accurate area sampling method, the survey consisted of personal interviews with 2,633 service station operators. This sample is representative of all the operators in the United States. But the results can be broken down and cross tabulated to give a true sample of any of four different regional divisions.

What was studied

The first report covers such factors as station hours and rush periods, gallonage sold, customer credit, and the use of customer mailing lists.

The second report, which will soon be ready for distribution, will discuss the dealer's knowledge of the products he sells, including his knowledge of additives and their functions. It also records dealer opinions of gasoline sales assets and knowledge of pricing.

Future reports

The third report will cover dealer-supplier relationships, opinions of dealer meetings, publications, and advertising. The fourth report covers the dealer's relationship with his employees, his own background, dealer associations, his income and method of paying his employees.

The fifth report will deal with the interrelationship of all the previously discussed factors . . . such as how station hours, dealer meetings and education affect sales volume. As such, it will be an extremely penetrating and significant report.

Available to marketers

This continuing survey work is done by Du Pont for the petroleum industry. And the findings are readily available to all oil companies. In addition to the regular distribution of reports to marketing executives, the entire survey has been tabulated on IBM cards which will give a wide variety of specialized breakdowns to meet the individual needs of various oil companies. For more information about this survey, just get in touch with any of our representatives or regional offices.

ASSISTANT MID-CONTINENT MANAGER

BARRETT B. RUSSELL is assistant manager of Du Pont Petroleum Chemicals Division's Mid-Continent Region with headquarters in Tulsa, Oklahoma.

Before joining the Du Pont Company in 1950, Mr. Russell was an engineer with the Standard Oil Development Company. In this capacity he worked on catalytic cracking, jet fuels, gasoline blending, special lubricants and combustion studies both at Baton Rouge, Louisiana, and Linden, New Jersey.

At Du Pont, he has been Sales-Service Representative and Sales Supervisor in the Central Region and Technical Assistant to the Sales Manager in Wilmington.

A graduate of Massachusetts Institute of Technology with a B.S. degree in Chemical Engineering, Mr. Russell is a member of the American Petroleum Institute, Society of Automotive Engineers, and the American Chemical Society.

One simple word can spell bigger TBA profits for your dealers

More TBA items are bought from service stations than from any other source. Why? . . .

It may be pure luck . . . because the Du Pont survey, "The Service Station and the Motorist," shows that, in practically every case, the sale started with the customer's *requesting* an item — rather than any *selling* on the dealer's part.

SELLING, therefore, is the word . . . the key to increasing, or possibly even multiplying, TBA profits for your dealers.

To help you alert your dealers to the opportunities, stimulate them to do more TBA selling, we have just prepared a new booklet (No. 5) in the Du Pont "through the windshield" series. The title is "A look at the TBA buyer." The copy, based on market data collected for the Du Pont survey, "The Service Station and the Motorist," is simply written so that it will be easy for the average dealer to understand and remember.

Ask one of our representatives or regional offices for sample copies and cost information on obtaining these booklets in large quantities for your dealers.

DU PONT
REG. U.S. PAT. OFF.
Better Things for Better Living
. . . through Chemistry

Petroleum Chemicals

E. I. DU PONT DE NEMOURS & COMPANY (INC.)
Petroleum Chemicals Division • *Wilmington 98, Delaware*

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ORGANIZED IN THE INTEREST OF GREATER SERVICE TO THE PETROLEUM INDUSTRY.

Painting, courtesy Power Magazine

New J-M Color Code

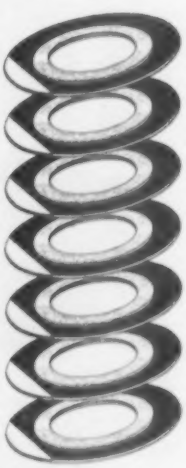
identifies metal in Spirotallic® Gaskets

Most engineers know that Spirotallic Gaskets maintain a perfect seal despite extreme fluctuation in fluid pressure and flange compression. Consequently, these gaskets are used in a wide range of service conditions which include high temperatures, elevated pressures and active corrosives. To withstand these conditions, Spirotallic Gaskets employ a variety of corrosion-resistant alloys.

Because so many of these metals look alike, only expensive tests or costly experience with the gasket could determine the gasket metal used, once its identifying tag was lost. Now the color patch on the centering guide tells the metal employed and saves time, trouble and expense. This new method of identification also makes it easier for storekeepers and mechanics who handle the gasket. In addition, it simplifies inventories.

Spirotallic Gaskets hold their seal because they are made of spirally wound interlocking plies of asbestos and spring-like metal strip. These gaskets compress easily with light bolting. For catalog PK-35A and copy of color code card write Johns-Manville, Box 60, New York 16, N. Y. In Canada, Port Credit, Ont.

Here are seven of the metals available and their color identifications



Zinc-coated steel—white

Type 304 Stainless—yellow

Type 316 Stainless—green

Type 347 Stainless—blue

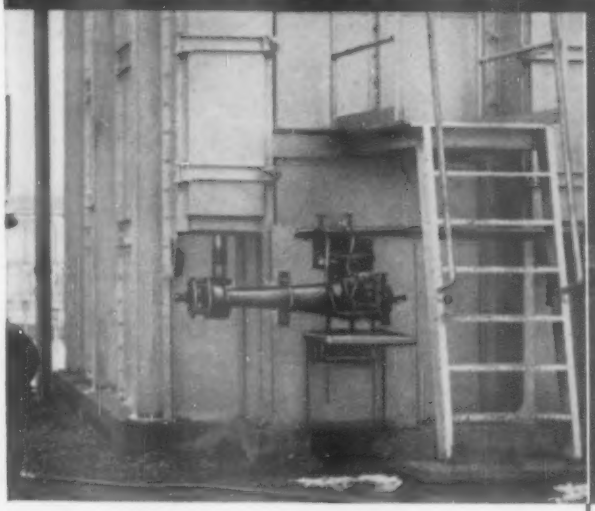
Monel—orange

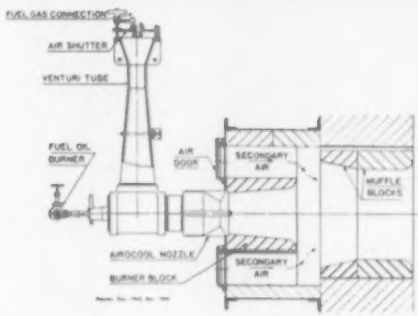
Copper—brown

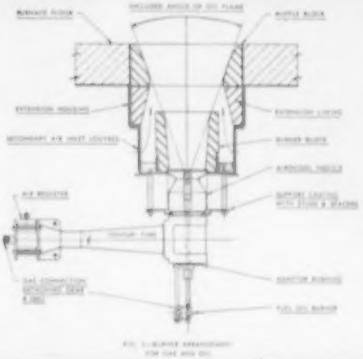
Aluminum—aluminum

Johns-Manville SPIROTALLIC GASKETS

horizontal or vertical







many more hours on stream, without forced shutdown with National Airoil Oil-Gas tandem combustion units

Exclusively for vertical firing, the new National Airoil VERTICAL Tandem Block Units retain all the features of our regular horizontal Tandem Units . . . *plus:* special, pre-cast refractory shapes for easier, cost-saving vertical installation and maintenance; secondary air inlet louvres for positive control of vertical flame pattern; and, all steel duplex detaching gear which enables simple vertical burner change over.

VERTICAL and HORIZONTAL Tandem Units hold air in the combustion zone until fuel and heated air are thoroughly mixed. This means that ignition takes place in a hot zone; the result: high fuel economy through more rapid combustion with a minimum of excess air. NATIONAL AIROIL's patented Tandem Combustion Units allow secondary air to be easily and accurately controlled. By adjusting air control louvres, flame can be shaped to radiate heat uniformly without tube impingement.

The VERTICAL or HORIZONTAL Tandem Unit is always fired with NATIONAL AIROIL Combination Oil and Gas Burners . . . has a high turndown ratio with a steady flame temperature using either fuel oil or gas. With the TANDEM UNIT's clean flame, a cold furnace can be brought to full capacity in a short time.

"Many, many more hours on stream, without shutdown" . . . yes, YOU will realize higher profits from YOUR heaters when NATIONAL AIROIL VERTICAL or HORIZONTAL Tandem Units are specified. Our new Bulletin 498 is yours for the asking.

CHEMICAL-PETROLEUM DIVISION

NATIONAL AIROIL BURNER CO., INC.

Main Office & Factory: 1236 EAST SEDGLEY AVENUE, PHILADELPHIA 34, PA.
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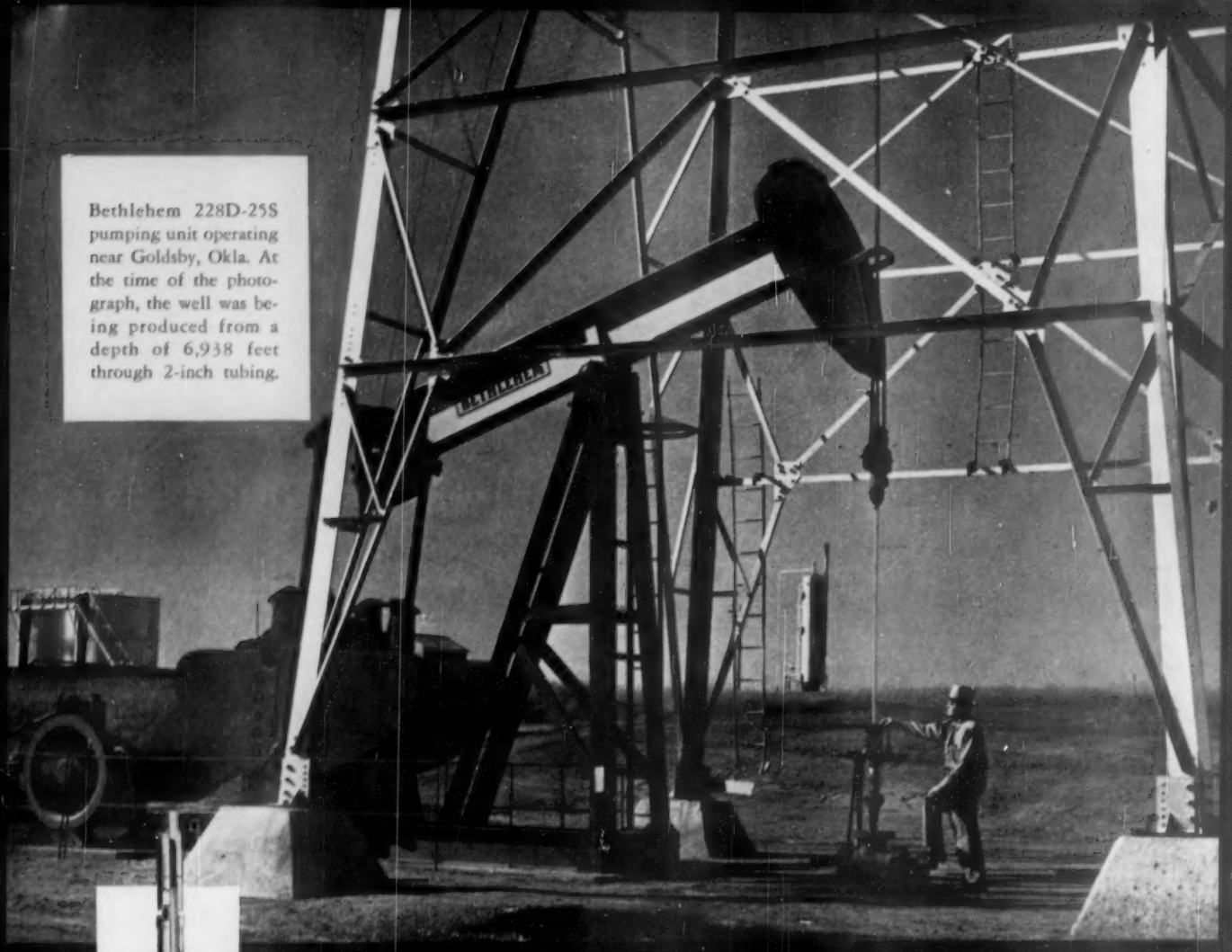
INDUSTRIAL OIL BURNERS, GAS BURNERS, FURNACE EQUIPMENT



Bethlehem 228D-25S pumping unit operating near Goldsby, Okla. At the time of the photograph, the well was being produced from a depth of 6,938 feet through 2-inch tubing.

For the Smoothest Pumping Job You Ever Saw

Whenever a well of yours is ready for the pump and you're looking for equipment . . . make it All-Bethlehem! Bethlehem surface unit, rod string, and bottom-hole pump. The outfit will give you a smoother, more trouble-free performance than you ever before experienced.

No matter what type of wells you have on your lease, you can obtain the right combination of "matched" equipment from Bethlehem. Here's what we offer:

Pumping Units. These are available in an exceptionally wide list of choices. They begin with the 10D-4, a tiny unit that is perfect for stripper production and pilot waterfloods. They range all the way to the giant 640, a really huge model with 16-ft stroke and 34,000-lb beam. Included in the line are special units equipped with portable base.

Sucker Rods. A complete selection, including the Type 43 high-strength rod for deep-hole jobs. There's a Bethlehem sucker rod for every well condition in the field.

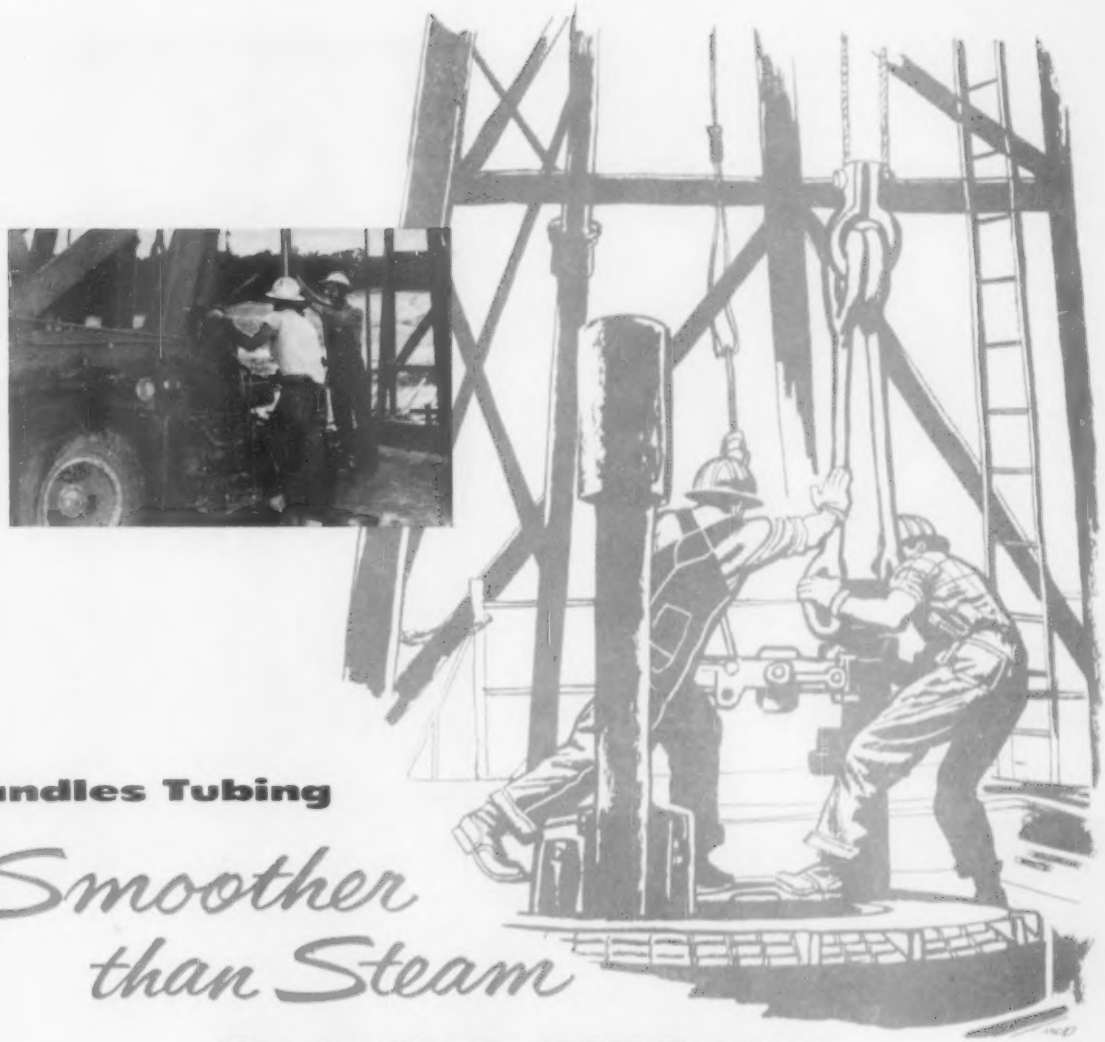
Beeline Pumps. These up-to-the-minute subsurface pumps are also available in a wide range of sizes and types. Whether your well is shallow or deep, sandy or gaseous, ornery or docile, you can select a Beeline Pump that's perfect for the job.

So specify an All-Bethlehem outfit the next time you're in the market for this equipment. Put it to work and watch it go. You'll find you've bought yourself a smoothie!

BETHLEHEM SUPPLY COMPANY

General Offices: 21 E. Second St., Tulsa, Okla.

BETHLEHEM STEEL



Handles Tubing

Smoother than Steam

Works Wells 25% Faster

"Easy to operate, gives steady power with no slap, jump or grab."

That's how Sutherland Well Service Company owner, Arthur Sutherland, describes the operation of the TORQMATIC DRIVE in his Cooper well-servicing unit.

And he reports he can service wells at least 25% faster with his TORQMATIC-equipped Cooper unit; points to the fact that he completed a swabbing job on a 5500-foot well (5½" casing) in 3 hours, compared to 5 hours needed by a mechanical-drive unit on a similar well.

Mr. Sutherland says *smoother than steam* TORQMATIC power transmission on the winch protects well-tubing from harmful shock loads or strains, gives an automatic safeguard against breaks or twist-offs. And the TORQMATIC DRIVE cuts maintenance costs, too. For example, it lengthens drum-clutch life because there's no need to slip clutches.

Well-owners, impressed by the servicing speed and tubing protection they get with Mr. Sutherland's unit, recommend him to other oil men. As a result he's added at least three new customers since he put his unit into operation.

Allison's TORQMATIC DRIVE also propels the Cooper unit at 40 m.p.h. over the road. Mr. Sutherland reports it eliminates the need for a bulldozer to get on location over soggy, muddy ground because smooth power transmission maintains traction in toughest going.

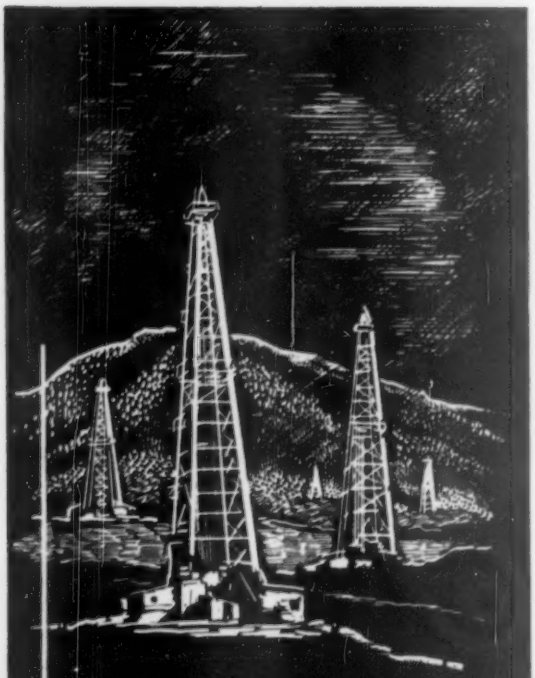
You can get Allison TORQMATIC DRIVES in servicing, drilling or fracturing units made by most leading manufacturers. Get full details on Allison TORQMATIC DRIVES for your equipment from your manufacturer or dealer or write to Allison Division of General Motors, Box 894R, Indianapolis 6, Indiana.

GM TORQMATIC

Allison

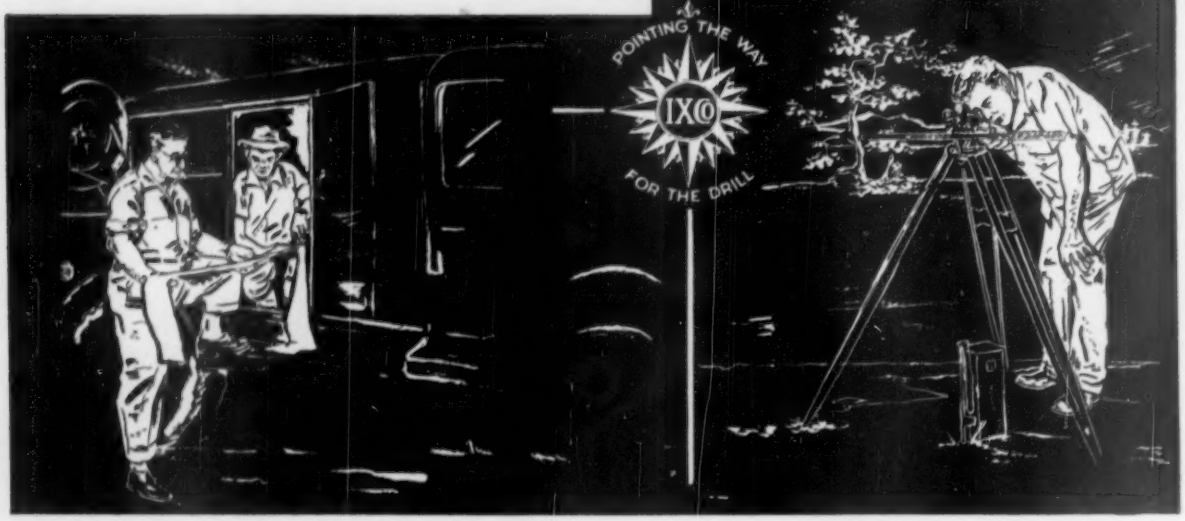
TORQMATIC DRIVES

It's a long, long way from the bottom of a surveying party to the top man position. However, B. B. Robinson, Jr., like so many other IX personnel, started as a surveyor with a party over 20 years ago . . . worked up through the jobs of observer, computer, and party chief to his present position of supervisor and manager of IX's Fort Worth office.



DERRICKS TODAY

Where I.X. Parties Were Yesterday



No seismographic survey party picks up its know-how overnight – it takes years of intensive field work . . . years of working together . . . before a party can be depended on to turn in a fast and accurate survey. That's where Independent Exploration parties come out on top – they're staffed with the know-how that comes from experience. These parties know the shortcuts that save time and money without sacrificing accuracy – employ these shortcuts to *your* advantage. Enlist this invaluable extra on your *next* survey – call on IX for a better job.

Independent

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Geophysical Surveys

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stainless steels are thoroughbred, too

The experienced exhibitor rents extra stalls... leaves them empty... to prevent contamination of his thoroughbred pets by canine neighbors.

To develop their best qualities demands *exclusive* care. That is why Sun Ship's new Alloy Products Shop has been planned for the *exclusive* fabrication of stainless and alloy steel products. When you have selected from the many available Alloys a stainless steel best suited for your service condition, you have done only half the job. You must also provide for the best possible fabrication if you are to have full protection—"A Thoroughbred Job."

Why entrust stainless steel to be fabricated in the same shop where carbon steel products are fabricated, and subject this precious metal to contamination with iron fragments, dust, or other harmful elements? A segregated shop is your answer.

Sun Ship now operates an all-alloy shop, one especially built and equipped for fabricating stainless and alloy products as they should be—segregated from carbon steel fabrication.

We emphasize the fabrication of medium and heavy stainless, alloy and aluminum products for industry.

Try Sun Ship for stainless fabrication as it should be done.

Our Sales Engineering Department will be pleased to assist you with any of your fabrication problems.

Sun Ship also makes all types of carbon steel pressure vessels.

ALLOY PRODUCTS SHOP

OF Sun SHIPBUILDING & DRY DOCK COMPANY

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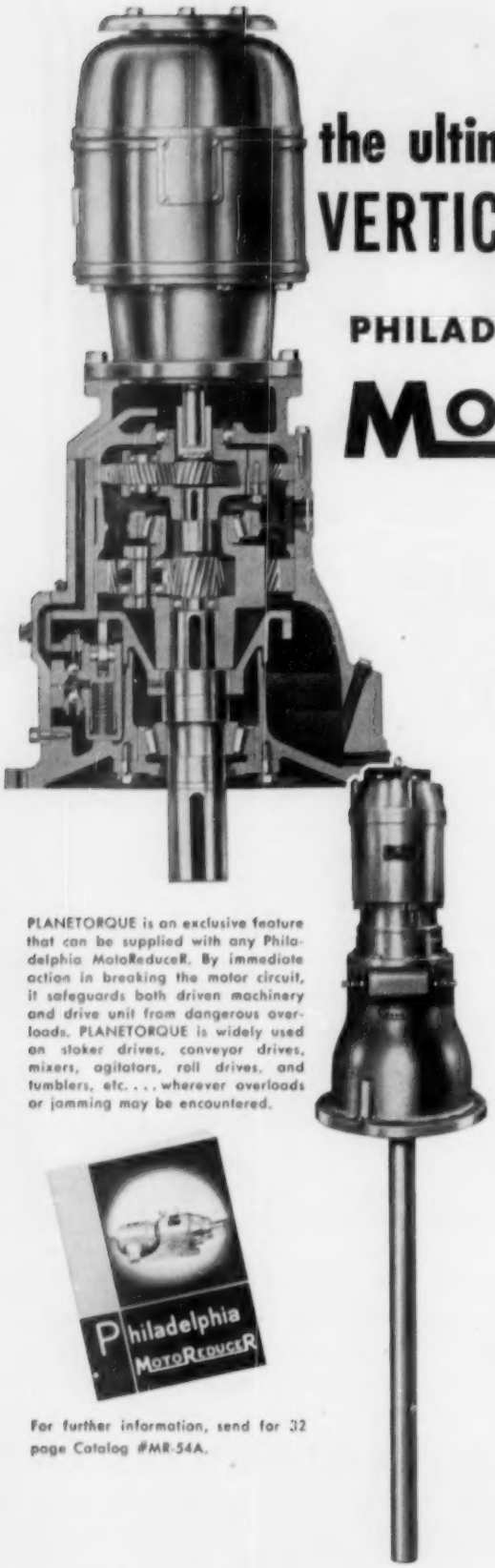

the ultimate in VERTICAL SHAFT DRIVES

PHILADELPHIA MOTOREDUCER

The ultimate in compact, neat and sturdy vertical motoreducers. These reducers have given outstanding performance in thousands of industrial applications requiring a reliable Vertical Drive.

Because of the *unique single casing and bolted-on motor construction,* mounting and installation is simplified through elimination of extra baseplates and couplings. The planetary reduction gears provide an extremely rugged drive capable of withstanding the most severe overload service conditions. Another advantage of the Philadelphia MotoReduceR is its wide bearing span, which permits the use of long unsupported vertical shafts.

So we say: "Examine the construction of these units, and you'll understand why there's nothing like them".

PLANETORQUE is an exclusive feature that can be supplied with any Philadelphia MotoReduceR. By immediate action in breaking the motor circuit, it safeguards both driven machinery and drive unit from dangerous overloads. PLANETORQUE is widely used on stoker drives, conveyor drives, mixers, agitators, roll drives, and tumblers, etc. . . . wherever overloads or jamming may be encountered.

For further information, send for 32 page Catalog #MR-54A.

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NEW YORK • PITTSBURGH • CHICAGO • HOUSTON • LYNCHBURG, VA.
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Established 1892

None other like it!

Thermoid

TRIOFLEX Rotary Hose

Designed for portable drilling units, workover rigs and seismograph work, Thermoid Trioflex Rotary Hose gets the job done faster. It's light, flexible, easy to handle, and kink-resistant. And its brute strength means longer wear . . . fewer replacements.

Study its cross section view:

- Synthetic rubber tube resists oil and abrasion
- Braided steel wire reinforcement adds strength and flexibility
- Tough, specially compounded cover resists abrasion and aging

Every length pre-tested to 2000 psi

Furnished in three sizes:

2″—with 2″ male couplings, API threads

2½″—with 2½″ male couplings, API threads

3″—with 3″ male couplings, API threads

Get Trioflex and other Thermoid oil field products listed below from your supply house or from one of the Thermoid warehouses located in:

Houston, Texas
Oklahoma City, Okla.
Nephi, Utah
Casper, Wyoming
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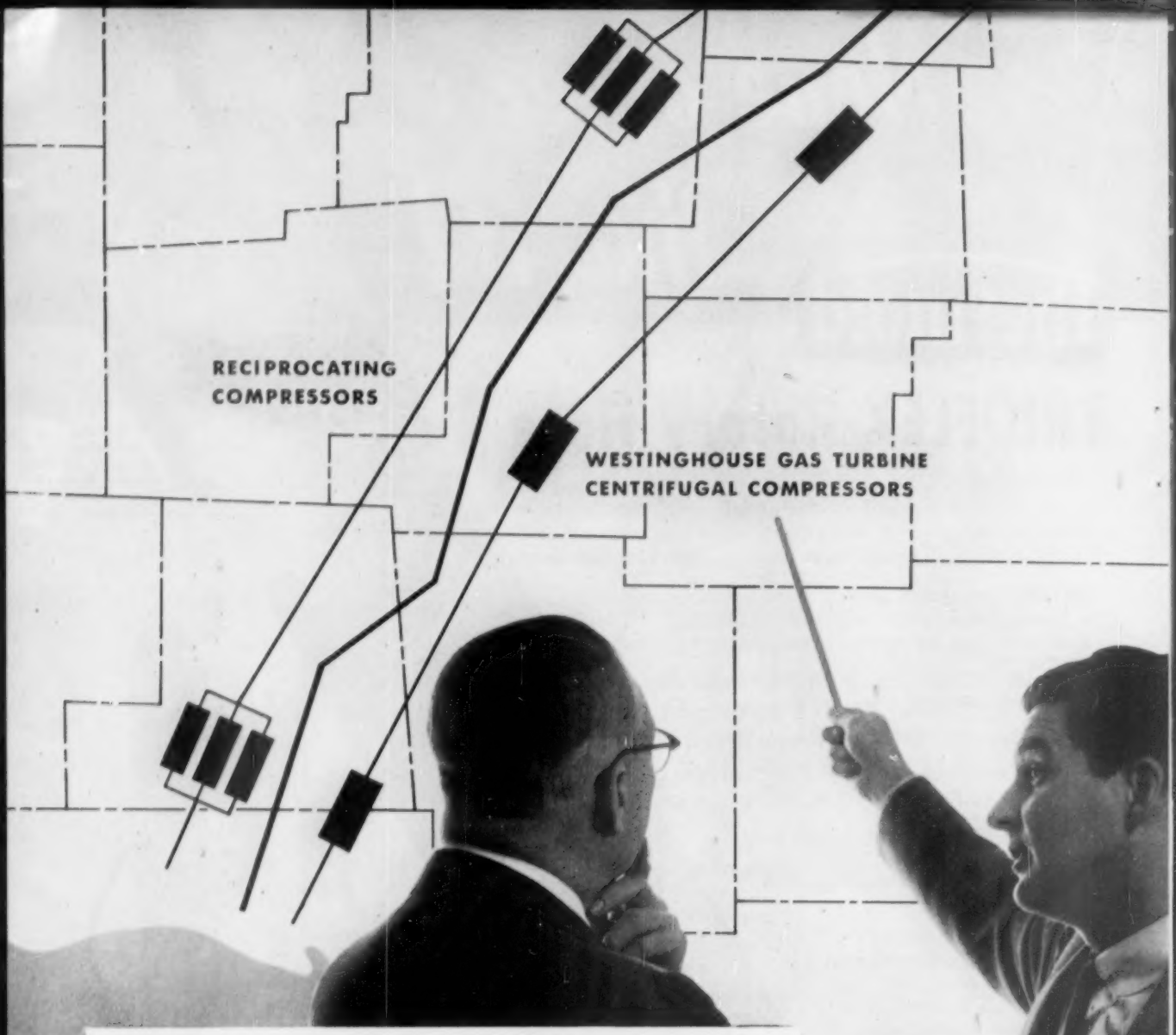
* Special pressed-on couplings are an exclusive Thermoid design. Anchored securely . . . guaranteed for life of hose.

Thermoid

Powerflex Rotary Hose • Trioflex Slim-Hole Rotary Hose • Mud-Flo Slush Pump Hose • Flexible Discharge Units • F.H.P. and Multiple V-Belts • Oil Country Flat Belting

Wire Line Turn Backs • No-Wip Line Savers • Stuffing Box Rings • All Types of Hose • Molded Specialties • Brake Blocks

Thermoid Company • Offices & Factories: Trenton, N. J., Nephi, Utah

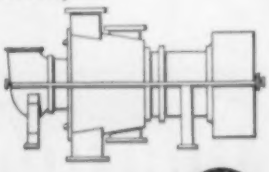


FACTS on Westinghouse 5000-hp gas turbines . . .

Delivers gas with less horsepower

Gas-turbine-driven centrifugal compressors give high efficiency at high-flow, low-compression ratio. • Stations can be spaced closer together, maintaining a high average pressure with less horsepower. • Any one centrifugal compressor can handle the full flow, so fewer units are required for a given length of pipelines. • Gas turbines are high-speed prime movers—no reduction gears required to drive centrifugals efficiently.

For more information, see your Westinghouse sales engineer, THE MAN WITH THE FACTS, or write for booklet B-5859, Westinghouse Electric Corporation, 3 Gateway Center, Pittsburgh 30, Pa. J-50578



YOU CAN BE SURE...IF IT'S Westinghouse

MARSH
Christmas Tree
GAUGE
...it stands alone-
In this latest development we reaffirm our pledge to make a better gauge ever better. Only in the Marsh Christmas Tree Gauge you have:
—A better tube construction— bourdon tube and socket fused into a one piece permanently leak-proof unit by the exclusive Marsh "Conoweld" process.
—A better movement— all but frictionless as a result of the self-lubricating effect of unlike metals. Coined sector gear gives greater strength where greater strength is needed; also smoother operation.
—A better case— a copper-clad wrought steel case of boiler plate thickness, produced by the "Marsh-alloy" process. It has the strength of steel, the corrosion resistance of copper, and is one-third lighter than conventional cast-iron cases. The case is finished in corrosion-resistant satin black enamel.
—the Marsh "Recalibrator"— not only the handiest way to keep a gauge accurate; also the best way.
★ There is a Marsh Gauge for every oil country and refinery application. Ask your supply house or write for latest bulletins.
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Marsh Instrument & Valve Co. (Can.) Ltd. 8407 103rd Street, Edmonton, Alberta, Canada
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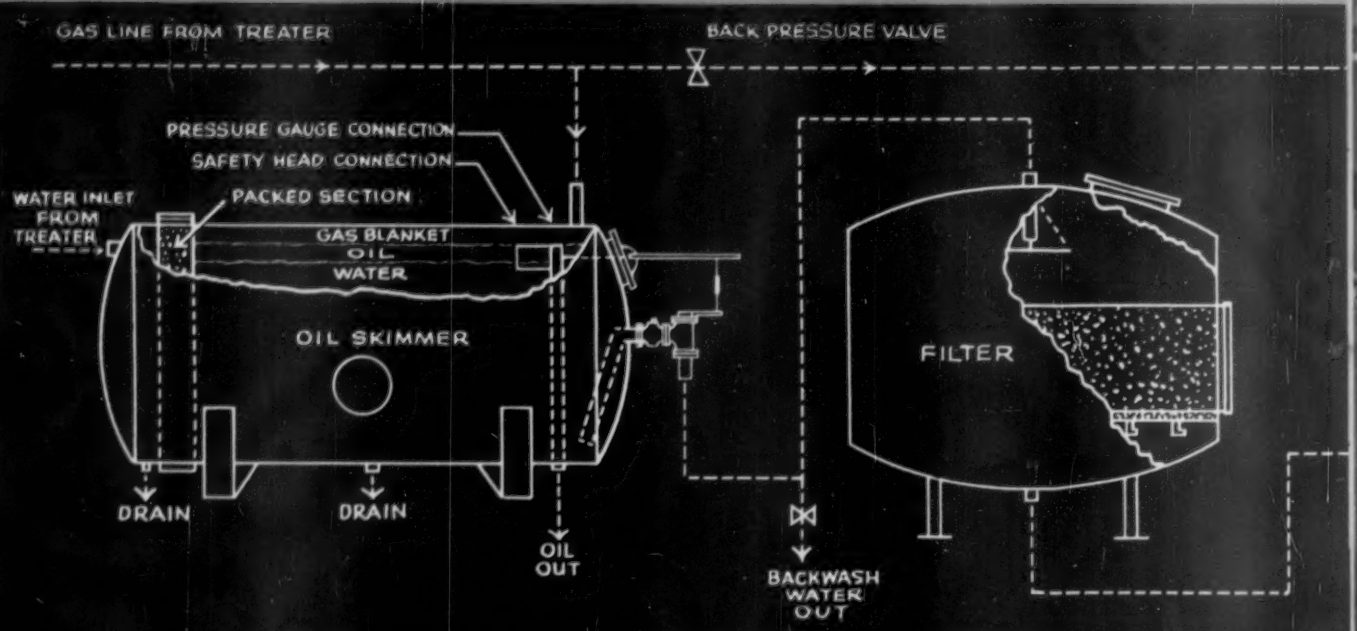
STOCKED by Your Local Supply Store
GAUGES

For The Preconditioning Of Subsurface



FLOW DIAGRAM OF BS&B AQUA-KLEENER SYSTEM

There Is No Better Equipment Than BS&B

Conditions under which water conditioning and filtering systems must operate vary widely from one water flood project to the next. The degree of water treatment required will depend on the condition of the produced water and the characteristics of the formation into which the water is to be injected. That is why the new BS&B AQUA-KLEENER is today's *outstanding* water conditioning and filtering system for use on water flood projects!

AQUA-KLEENER is a closed type system which prevents air from contacting the water —thereby minimizing corrosion, excluding air-borne bacteria and preventing the oxidation of such substances as soluble iron.

The AQUA-KLEENER System consists basically of a primary separating unit, an oil skimmer, separate filter and backwash water tank (or a combination of the two), and auxiliary controls and equipment. Its *design flexibility* enables you to use it as a complete water conditioning system—or to employ only parts of it to augment an existing installation.

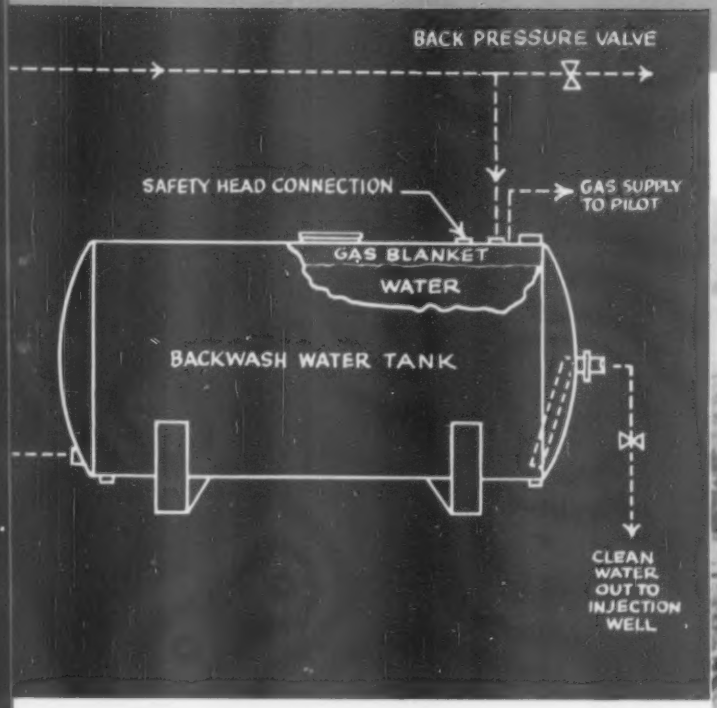
The "heart" of the AQUA-KLEENER System is an improved type filter using porous aluminum oxide underdrain plates under a filter bed of Anthrafilt No. 1. In comparative tests, this type of filter has been found to be greatly superior to the graded bed filters of sand and gravel commonly used in other systems, as shown by the following:

EFFICIENCY
OVER 60 YEARS
BS&B
RELIABILITY
ANOTHER EXAMPLE OF PRODUCT LEADERSHIP

BLACK, SIVALLS

Oil & Gas Equipment Division, Dept. 1-A7A

Injection Water On Water Flood Projects...



AQUA-Kleener!*

- Filter runs are longer before backwashing is necessary.
- Only half as much backwash water is required for cleaning.
- Filter material weighs approximately one-half as much.
- Filter material does not react with alkaline water, algae, bacteria or such dissolved substances as soluble iron.
- Filter bed does not pack as tightly, therefore resulting in a lower pressure drop.
- Higher porosity and greater surface area of filter material results in more efficient removal of turbidity and bacteria.

If you'd like more detailed information on the new BS&B AQUA-KLEENER System, contact your nearest BS&B Representative — or write to us direct.

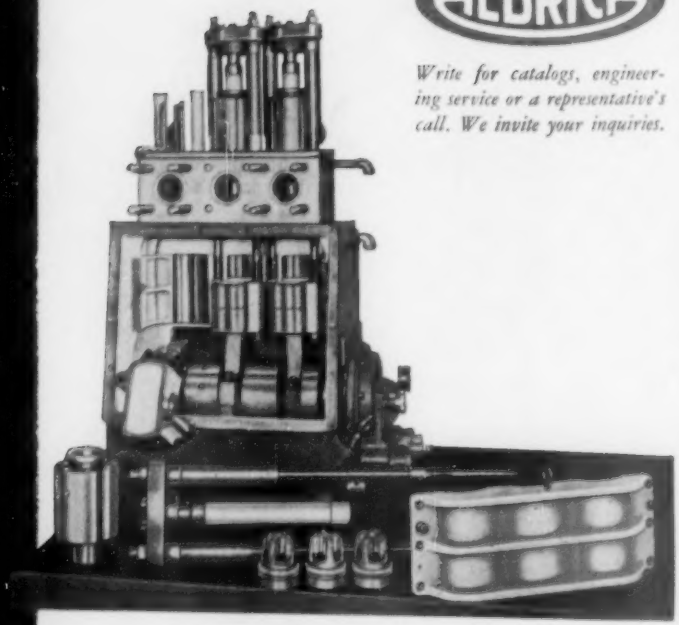
* AQUA-KLEENER is a trade name of Black, Sivalls & Bryson, Inc.

Photo shows BS&B AQUA-KLEENER System with oil skimmer at left, "Filta-Wash" (combination filter and backwash water tank) in center, and storage tanks at right. Pump house is in the background.

& BRYSON, INC.

1708 West Main Street Oklahoma City, Oklahoma

Why ALDRICH PUMPS Reduce Maintenance Cost



ALDRICH

Write for catalogs, engineering service or a representative's call. We invite your inquiries.

Design simplicity . . . rugged construction

Aldrich Pumps are built to take punishing service year after year. You can find Aldrich Pumps, today, in good running order after 30, 40 and even 50 years of service. Durability such as this is the result of Aldrich's design simplicity and rugged construction.

Accessibility . . . sectionalization

When wearing parts are due for replacement, in Aldrich Pumps they can be replaced easily, quickly and at low cost. For instance, manifolds can be moved out on the holding studs and you can lift out and replace valves as complete units. . . . Stuffing boxes are particularly accessible—making it easy to renew packing. . . . To meet a change in pressure or capacity requirements, plunger sizes can be changed — in most cases merely by using new glands, throat bushings and packing in the same fluid-end. . . . Wearing parts are interchangeable among pumps of the same stroke size. . . . Fluid-ends are sectionalized to make possible low cost parts replacement and can be made of stainless steel, bronze, Monel or other material.

Aldrich Pumps Are Used For:

Water flooding
Salt water disposal
Lean oil service
Reactor charge
Crude and gathering lines
Product lines
Bottom hole pump service
Liquid hydrocarbons

Aldrich Pump spare parts are stocked at Mid-Continent and California locations.

Representatives in Principal Cities

The Aldrich Pump Company

9 Gordon Street • Allentown • Pennsylvania

ALDRICH PUMPS RANGE FROM 10 TO 2400 HORSEPOWER

Mathieson Caustic Soda: *why settle for less?*

In the lime-soda process—one of the two important methods of making caustic soda—the causticizing operation begins in huge settling tanks like those above. Here, a soda ash solution is treated with milk of lime, calcium carbonate is precipitated and a dilute caustic liquor obtained. This liquid is then filtered and concentrated to the commercial 50% and 73% solutions, as well as to the solid, flake, and granular forms. Lime-soda process caustic is produced at Lake Charles, La., and Saltville, Va.; four other strategically located plants produce electrolytic process caustic to make Mathieson a major source of this essential chemical raw material.

Multiple-process and multiple-plant facilities give Mathieson's caustic soda customers the dependability they want. It means their source of caustic is not controlled by seasonal fluctuations in chlorine demand as is sometimes the case when production is limited to the electrolytic caustic-chlorine process. This operational flexibility is also typical of other Mathieson chemicals—5 chlorine plants, 7 sulphuric acid plants, 3 alkali plants, 3 ammonia plants, provide a safety factor that assures a reliable source of chemical raw materials.

Call on us when planning current or future chemical requirements. Perhaps you can buy to better advantage from one of America's largest producers of basic industrial chemicals.

MATHIESON CHEMICALS

OLIN MATHIESON CHEMICAL CORPORATION

INDUSTRIAL CHEMICALS DIVISION • BALTIMORE 3, MD.

MATHIESON

2761

CAUSTIC SODA • SODA ASH • CHLORINE • SULPHURIC ACID • SULPHUR • AMMONIA • NITRATE OF SODA • BICARBONATE OF SODA • NITRIC ACID • SULPHATE OF ALUMINA • SODIUM CHLORITE PRODUCTS
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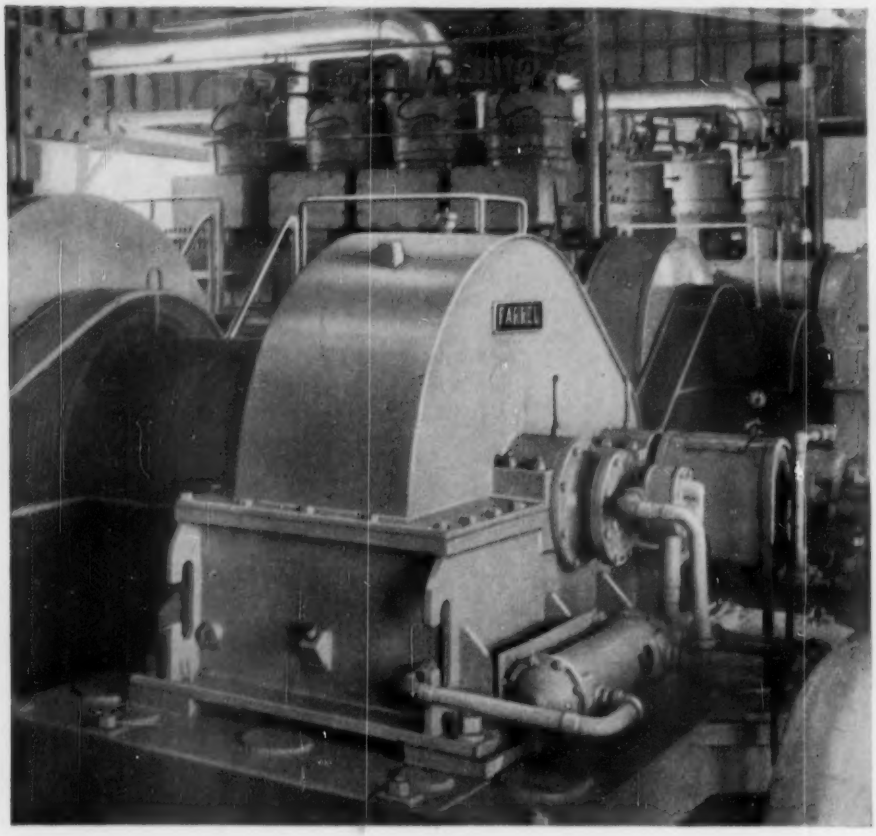
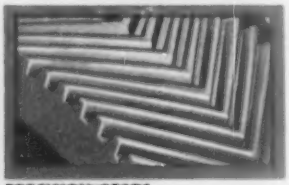
Farrel speed increasers give you smooth power transmission year after year . . . here's why

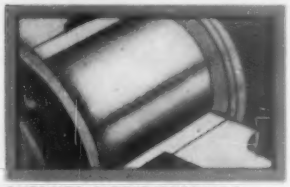




PRECISION GEARS
Herringbone gears generated with extreme precision by the Farrel-Sykes process.

A "FOUNTAIN OF YOUTH"
Completely self-contained circulating system furnishes pressure lubrication to all bearings, and spray lubrication to gears.

PRECISION-GROUND SHAFTS
Extra large for the power to be transmitted. Give added stiffness against bending and torsional deflections.

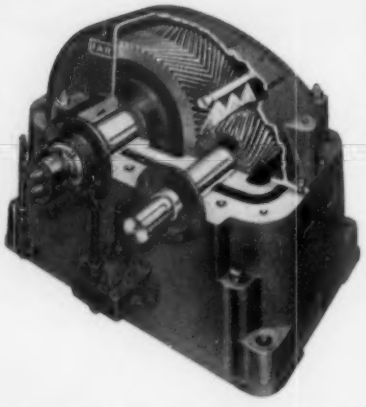


OVERSIZE SLEEVE BEARINGS
With consequent low unit pressures. Precision finished to extremely close tolerances.

VERY RIGID HOUSING
Holds rotating elements in original alignment, insuring maintenance of operating smoothness of gearing.

Since 1932, Farrel has worked closely with the oil industry to design speed increasers which will deliver power smoothly, year after year, meeting the unusual as well as the usual requirements of pipeline pumping service.

The standard line consists of 49 sizes with speed ratios ranging from 1:1 to 12:1. For higher ratios, double step-up units are supplied with ratio range from 12:1 to 40:1. For details of these proved-on-the-job speed increasers, send for a copy of bulletin 448A.



Farrel speed increasers in operation, including those originally furnished twenty-two years ago, now total over a quarter of a million horsepower.

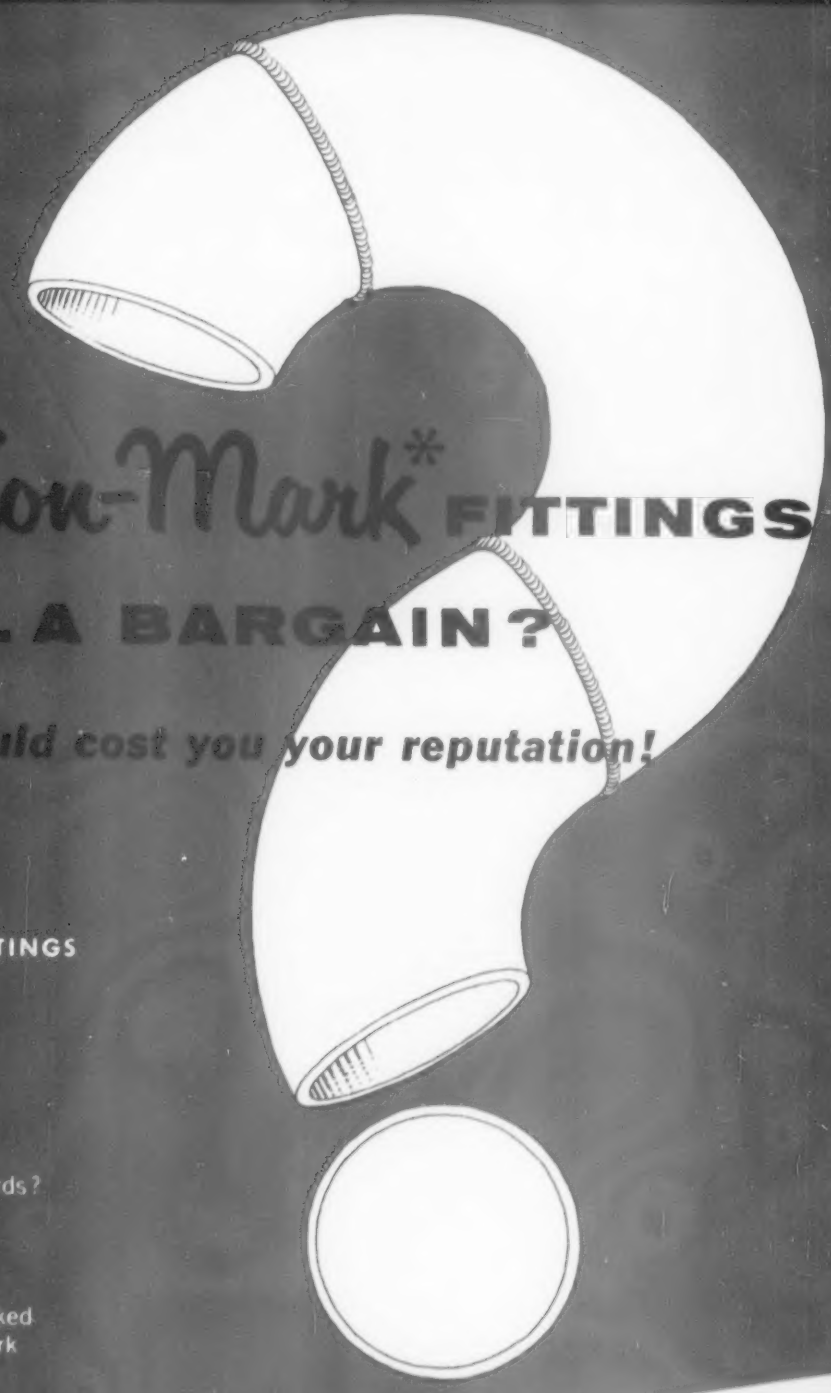
FARREL-BIRMINGHAM COMPANY, INC.
ANSONIA, CONN.

Plants: Ansonia and Derby Conn., Buffalo and Rochester N. Y.
Sales Offices: Ansonia, Buffalo, New York, Boston, Akron, Detroit, Chicago, Fayetteville (N. C.), Memphis, Minneapolis, Portland (Oregon), Los Angeles, Salt Lake City, New Orleans.

OIL FIELD REPRESENTATIVES:
Hercules-Lupfer Engine Sales Co., 124 N. Boston St., Tulsa 1, Oklahoma. V. W. Osborne, 860-A M & M Building, Houston 2, Texas

Farrel-Birmingham®

FB-924



Question-Mark* FITTINGS

...A BARGAIN?

They could cost you your reputation!

***QUESTION-MARK FITTINGS**

Who is manufacturer?
How about his reputation?
What is his experience?
Does he give service?
Does he offer complete line?
Is stock available nearby?
Do fittings meet U. S. standards?
Are dimensions accurate?
Is circularity true?
Equal to strength of pipe?
Are fittings permanently marked with manufacturer's trademark and material designation?

YOU RUN THESE RISKS WITH THESE UNKNOWN PRODUCTS:

Failure in service... work stoppage... waste.
Impaired efficiency due to improper design.
Non-uniformity... wastes manhours.
Poor availability... costly in emergencies.
Short-line supply... handicaps selection.
Lack of service or responsibility.
Lack of engineering help on piping problems.
Lack of cost-cutting advancements.

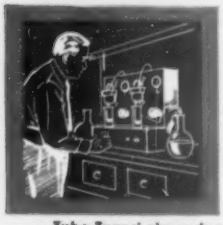
Presented in the interests of piping safety and economy by

TUBE TURNS

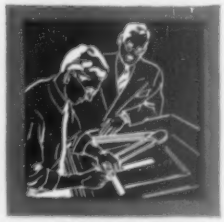
A Division of National Cylinder Gas Company
LOUISVILLE 1, KENTUCKY

... Producer of **KNOWN VALUES**

Tube Turns' nearby complete stock SAVES YOUR PURCHASING TIME



Tube Turns' pioneering research GIVES YOU ADVANCED PRODUCTS



Tube Turns' engineering help GIVES YOU COST-CUTTING IDEAS

How to safeguard your piping and get *more for your money*

When you buy TUBE-TURN* Welding Fittings and Flanges, you get these known values:

TOP QUALITY AND SAFETY **RESPONSIBILITY** **PRECISE UNIFORMITY**
ENGINEERING SERVICE **WIDE SELECTION** **LOWEST-COST PERFORMANCE**
PROMPT DELIVERY **DESIGN ADVANCEMENTS**

They are made in U.S.A. and are identified by the trade marks shown above.

They meet ALL American Standard and Safety Code requirements.

They are engineered to give maximum strength and performance and in many cases exceed requirements by generous margins.

To get *more for your money* in welding fittings and flanges, specify the leading brand and buy from your trusted Tube Turns' Distributor.

The Leading Manufacturer of Welding Fittings and Flanges

TUBE TURNS

LOUISVILLE 1, KENTUCKY

A Division of National Cylinder Gas Company

DISTRICT OFFICES: New York • Philadelphia • Pittsburgh • Cleveland • Detroit • Chicago • Kansas City • Denver
Los Angeles • San Francisco • Seattle • Atlanta • Tulsa • Houston • Dallas • Midland, Texas

*"TUBE-TURN" and "tt" Reg. U.S. Pat. Off.

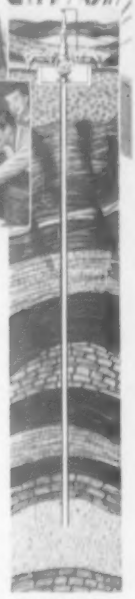
natural gas holes up, too!

But Nature's finest fuel goes underground in *summer!*

Cold weather may increase fuel requirements five fold. To assure you an uninterrupted, economical supply, natural gas — not currently needed — is stored in summer.

Pipeline companies pump vast quantities from their main lines into unused gas or oil fields, close to metropolitan markets. Literally seal it underground in porous sands capped by thousands of tons of rock and shale. Here natural gas is instantly available when winter storms shoot fuel demands skyward.

Tennessee Gas, the nation's longest pipeline, is developing five of these huge storage fields in New York and Pennsylvania. Another assurance that homes and industry in the East will be amply supplied with fuel for many years to come.



CROSS SECTION OF A TYPICAL UNDERGROUND STORAGE FIELD

TENNESSEE GAS
TRANSMISSION COMPANY
HOUSTON, TEXAS

AMERICA'S LEADING TRANSPORTER OF NATURAL GAS

One of a series of advertisements appearing in full color in national publications.

INSURANCE FOR THE FUTURE—Summer storage for winter use—another dramatic chapter in the development of natural gas. TGT advertisements like this tell millions of Americans how this great natural resource, once wasted or unused, is put to work. It's a story of which the natural gas industry can well be proud.

TENNESSEE GAS TRANSMISSION COMPANY
HOUSTON, TEXAS

This is Why the Nash is the Most Simple Compressor

It's the Nash!

There are no mechanical complications in a Nash Compressor. A single moving element, a round rotor, with shrouded blades, forming a series of buckets, revolves freely in an elliptical casing containing any low viscosity liquid. This liquid, carried with the rotor, follows the elliptical contour of the casing.

The moving liquid therefore recedes from the rotor buckets at the wide part of the ellipse, permitting the buckets to fill with gas from the stationary Inlet Ports. As the casing narrows, the liquid is forced back into the rotor buckets, compressing the gas, and delivering it through the fixed Outlet Ports.

Nash Compressors produce 75 lbs pressure in a single stage, with capacities to 6 million cu. ft. per day in a single structure. Since compression is secured by an entirely different principle, gas pumping problems difficult with ordinary pumps are often handled easily in a Nash.

Nash simplicity means low maintenance cost, with original pump performance constant over long periods Data on these pumps sent immediately on request

No internal wearing parts.

No valves, pistons, or vanes.

No internal lubrication.

Low maintenance cost.

Saves floor space.

Desired delivery temperature automatically maintained.

Slugs of liquid entering pump will do no harm.

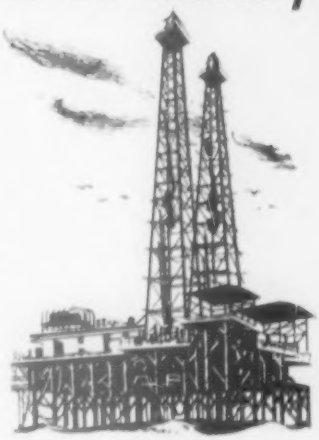
75 pounds in a single stage.

NASH ENGINEERING COMPANY

313 WILSON, SO. NORWALK, CONN.

AVONDALE breaking records in the Oil Industry

. . . for speed, power, size, performance! Yes, almost every day you hear of record-breaking equipment built by Avondale for the Oil Industry—the largest pipe jacket of its kind, a derrick barge with the greatest lifting capacity of any in the world. This is because Avondale specializes in meeting the increased demands of offshore drilling—accepting any challenge that will mean better service to one of her best customers, the Oil Industry. And Avondale delivers in record time, too—with production schedules topping the mark for speed and efficiency. No matter what your requirements . . . call Avondale!



SERVICE • INTEGRITY • EFFICIENCY

SHIP BUILDING · SHIP REPAIRING · FOUNDERS · PROPELLERS · STRUCTURAL STEEL

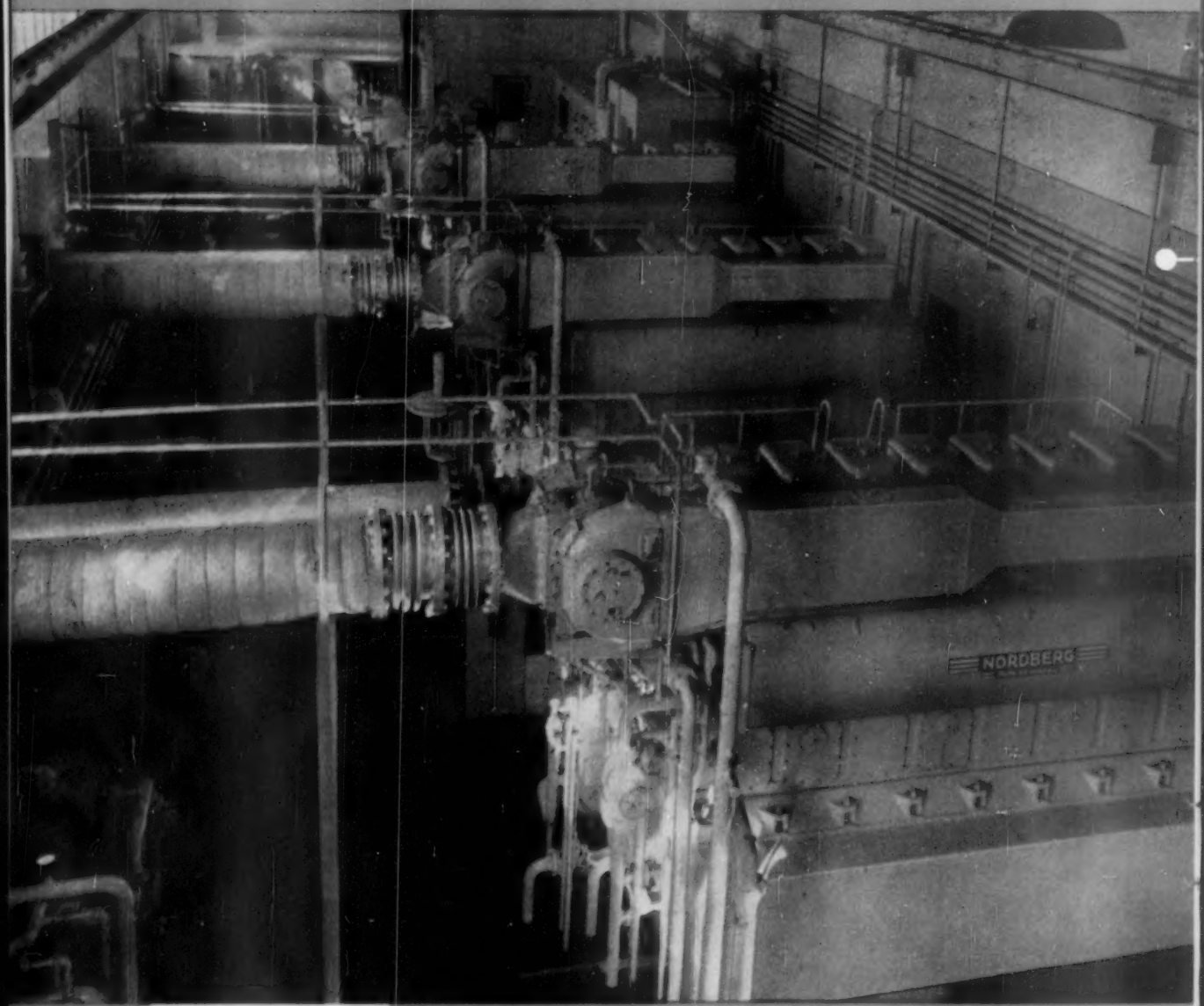
AVONDALE MARINE WAYS, INC.

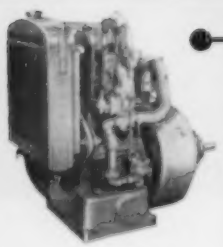
CABLE ADDRESS "AVONWAYS"

P. O. BOX 1030 PHONE UNiversity 4561 • NEW ORLEANS 8, U. S. A.

NORDBERG
SUPAIRTHERMAL®
ENGINES

. . . NOW SERVING MORE AND MORE MODERN PIPE LINES ACROSS THE NATION





NORDBERG POWER CHIEF GAS ENGINES

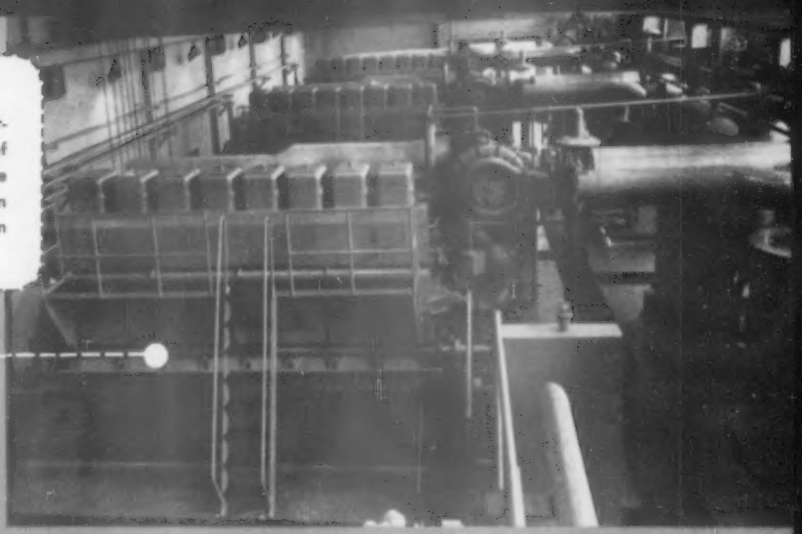
● NORDBERG *POWER CHIEF* Gas Engines are low cost, medium speed units, built for rugged oil field service. In jobs like production pumping and rig lighting, where 'round-the-clock performance is a must, you'll find these sturdy *POWER CHIEF* units capable of delivering maximum power at minimum operating and maintenance cost.

Sold as power units, delivering 18 hp max., with clutch power take-off . . . and as "packaged" generator sets producing up to 10 kw.

POWER CHIEF units are also available for Diesel service in 1, 2 and 3 cylinder units, from 10 to 45 hp.

LAKEHEAD PIPE LINE COMPANY

Twelve power-packed Nordberg *Supairthermal* engines will provide a total of 22,680 bhp for pumping stations along the Lakehead Pipe Line from the Canadian border to Superior, Wisconsin, and from there to Sarnia, Ontario.

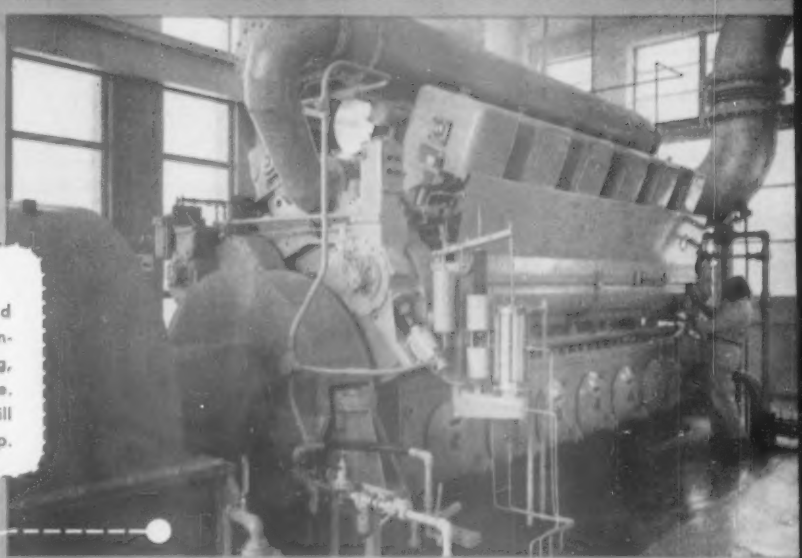


TRANS MOUNTAIN PIPE LINE COMPANY

Twelve powerful, compact Nordberg *Supairthermal* engines totaling over 20,000 horsepower have been given the tough power assignment of supplying crude oil from Edmonton, Alta., to Vancouver, B. C. on the Trans Mountain Pipe Line.

WOLVERINE PIPE LINE COMPANY

This compact, automatically-controlled Nordberg *Supairthermal* V-type Diesel engine furnishes all power for the Vicksburg, Mich., station on the Wolverine Pipe Line. Currently rated 2650 bhp, this engine will later be modified to develop 3200 bhp.



On the modern pipe lines across America, the trend is toward Nordberg four-cycle *Supairthermal* engine power. The reasons behind this trend are simple and sound . . . *Supairthermal* engines produce *more* power in *less* space — substantially reducing installation and operating costs. What's more — the efficiency of these powerful engines turns low fuel consumption rates into *profit dollars* at the end of the line.

Nordberg *Supairthermal* engines are available in a full range of sizes from 500 to 5000 hp for Diesel, Duafuel® or Spark-Ignition Gas operation, including both In-line and "V" types. The *Supairthermal* principle of operation increases the engine's load-carrying ability at any given speed, over a wide speed range. This reserve power is like *"money in the bank"* when additional line capacity is needed. Write for further information.

NORDBERG MFG. CO., Milwaukee, Wisconsin

Builders of America's Largest Line of Heavy Duty Engines — 10 to over 12,000 Horsepower

NORDBERG

DIESEL • DUAFUEL® AND SPARK-IGNITION GAS ENGINES

© 1955, Nordberg Mfg. Co.

0255

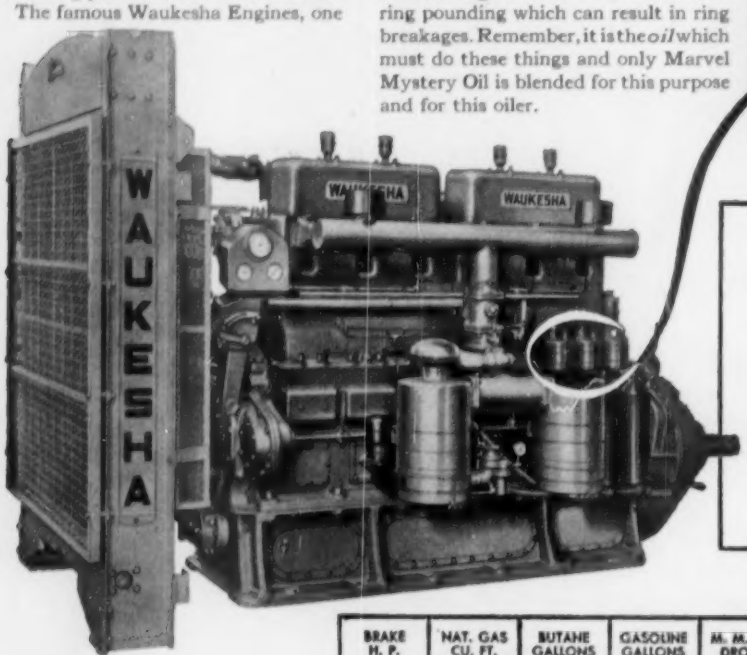
MARVEL INVERSE OILER—
Vital Part of World's Finest Engines

Engine manufacturers think so highly of the Marvel Inverse Oiler they have incorporated it as a vital unit in their engines' lubrication systems.

They have found that engines, equipped with Marvel Inverse Oilers, can be depended upon to give quick acceleration to save trip time . . . keep operating costs to a minimum . . . guarantee hours of continuous performance . . . keep "down-time" low by extending periods between overhauls.

The famous Waukesha Engines, one of which is pictured below, is an example. A truly fine performer, it is equipped with a Marvel Inverse Oiler for Marvel Mystery Oil—finest performing lubricant of all.

The Marvel Inverse Oiler feeds Marvel Mystery Oil in exact proportion to engine speed and load . . . properly lubricating valves and guides, preventing wear and sticking. Keeps upper piston rings free in their grooves . . . retards ring flutter . . . and cushions ring pounding which can result in ring breakages. Remember, it is the *oil* which must do these things and only Marvel Mystery Oil is blended for this purpose and for this oiler.



The Marvel Inverse Oiler

is an integral part of the Waukesha 550 H.P., 1200 RPM gas fuel engine. Operating off the intake manifold, these three completely automatic Oilers feed Marvel Mystery Oil exactly in proportion to engine loads . . . give direct protection to the all-important upper cylinder areas.

This Chart shows the proper setting for constant load engines

BRAKE H. P. AT BELT	NAT. GAS CU. FT. PER HOUR	BUTANE GALLONS PER HOUR	GASOLINE GALLONS PER HOUR	M. M. OIL DROPS PER MIN.	M. M. OIL HOURS PER QUART
10	115.	1.07	1.12	4	228
15	172.5	1.60	1.68	6	152
20	230.	2.14	2.24	8	114
25	287.5	2.67	2.80	10	91
30	345.	3.21	3.36	12	76
35	402.5	3.74	3.92	14	65
40	460.	4.28	4.48	16	57
45	517.5	4.81	5.04	18	50
50	575.	5.35	5.60	20	45
60	690.	6.42	6.72	24	38
70	805.	7.49	7.84	28	32
80	920.	8.56	8.96	32	28
90	1035.	9.63	10.08	36	25
100	1150.	10.70	11.20	40	22
120	1380.	12.84	13.44	48	19
140	1610.	14.98	15.68	56	17
160	1840.	17.12	17.92	64	14
180	2070.	19.26	20.16	72	12
200	2300.	21.40	22.40	80	11
225	2587.5	24.00	25.20	90	10
250	2875.	26.75	28.00	100	9
275	3162.5	29.42	31.10	110	8
300	3450.	32.10	33.60	120	7

Chart shows total oil consumption

EXAMPLE:—If you use 805 cu. ft. of dry gas, 7.49 gallons of butane or 7.84 gallons of gasoline, your H.P. is about 70, so adjust oiler to feed 28 drops per minute. You will then receive about 32 hours per quart of MARVEL MYSTERY OIL.

If engine load increases after setting for normal load, oiler will automatically increase its feed, decreasing when load is lessened.

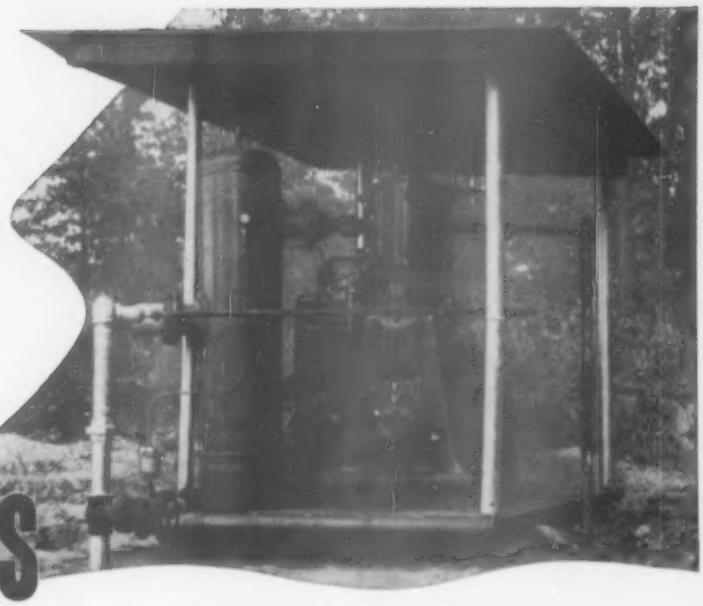
To determine drop count per oiler when more than one is used on an engine—divide recommended drop count by number of oilers.

NOTE: Guarantee on oiler is void if any other oil than MARVEL MYSTERY OIL is used. Some *engines* also carry this guarantee policy.

See Your Local Jobber or Oil Well Supply House

EMEROL MFG. CO. *Dept. 371, 242 West 69th Street New York 23, N. Y.*

JOY PACKAGED GAS COMPRESSORS



JOY CLASS WGB-110 GAS COMPRESSOR:
Inlet pressure—50 Psig., Discharge Pressure—200 Psig., Capacity—.5 MMCFD.

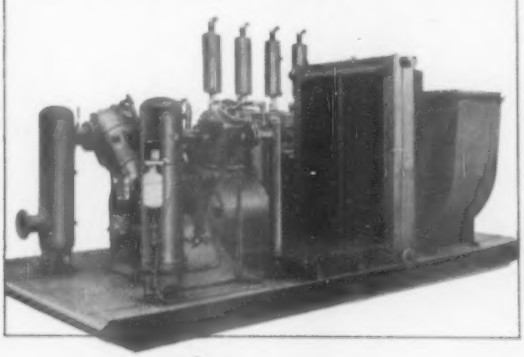
the only modern-design compressors for gas booster operation

No other gas compressors available today for booster service were designed as recently as the Joy Packaged Units, and offer as many modern advancements in design for field-proved economy and efficiency.

Best of all, these modern Joy Compressors are backed by a century-old reputation for low maintenance and long, uninterrupted operation. They are the most reliable you can put on the job for gas gathering, repressuring, or gas lifting . . . *because of these time-proved features:*

1. Field-replaceable cylinder liners.
2. Field-replaceable crosshead guides.
3. Patented Joy "Dual-Cushion" valves.
4. Full force-feed lubrication.
5. Anti-friction main bearings.

JOY CLASS WNB-112 GAS COMPRESSOR:
Inlet pressure—20 Psig., Discharge Pressure—650 Psig., Capacity—.8 MMCFD.



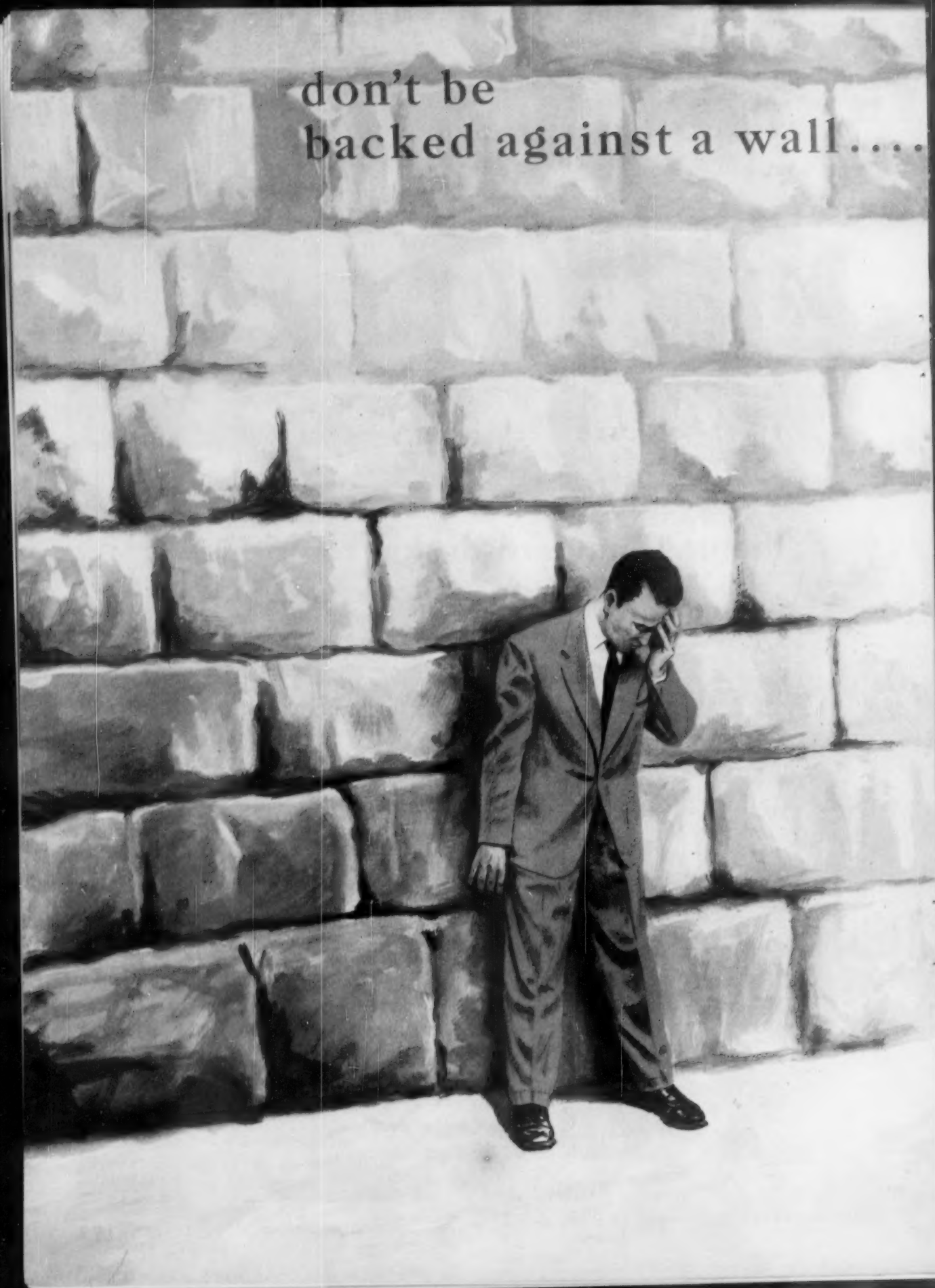
Available in vertical, V-type, and semi-radial designs for minimum space requirements, Joy gas compressors may be single- or two-stage units with cylinder sizes ranging from 3" to 13½". Four different frame types are available for a range from 50 to 400 H.P.

Your Joy representative can specify the most efficient compressor for your needs. Call him or write for Bulletin A-94. ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

Consult a Joy Engineer

JOY

SPECIALISTS IN THE COMPRESSION AND MOVEMENT OF AIR AND GASES SINCE 1885


don't be
backed against a wall....

HIGH OCTANE MOTOR FUELS CAN NO LONGER BE LOOKED UPON AS A PRODUCT OF THE FUTURE. Today's automotive engines require them . . . tomorrow's needs will be even more demanding.

To keep pace with these continually changing requirements, petroleum refiners must appraise their present refining facilities to be certain that they will be able to produce the motor fuels that will meet the demands of their markets . . . meet them in the most efficient and economical manner possible.

With Rexforming*, Universal has cracked the octane barrier. In so doing, it has provided the petroleum refining industry with a process that will meet both the immediate and future octane requirements.

To be certain that the economics of inadequate facilities won't have you backed against a wall, you should examine

Rexforming

TRADE MARK

carefully. Study its economy . . . its flexibility . . . in relation to your own refining and marketing problems. Such an analysis should reveal the many benefits that can be yours through this new concept in petroleum refining.

UNIVERSAL
OIL PRODUCTS
COMPANY

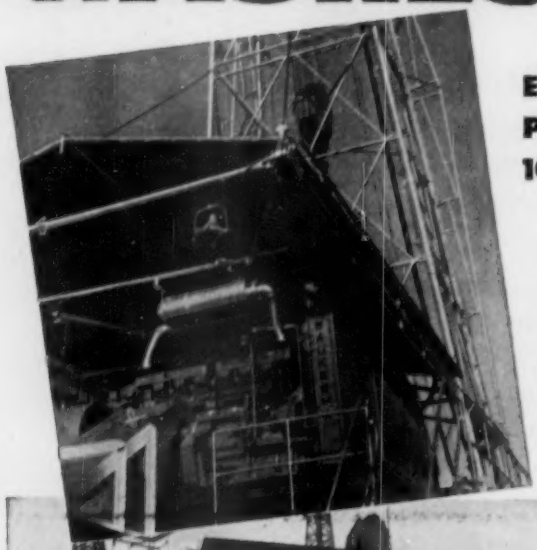
UOP ®

30 ALGONQUIN ROAD,
DES PLAINES, ILL., U. S. A.
Laboratories: RIVERSIDE, ILLINOIS

Universal Service
Protects Your Investment

**Developed by the Pioneers of Platinum Catalyst Reforming*

World's Finest Oil Field Power
WAUKESHA

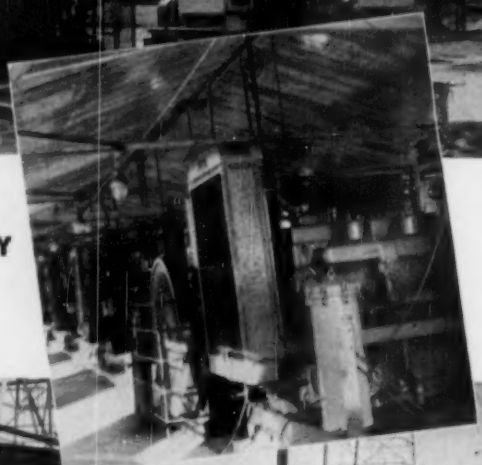


ENGINES and POWER UNITS 10 hp. to 1135 hp.

Send for

BULLETIN 1079

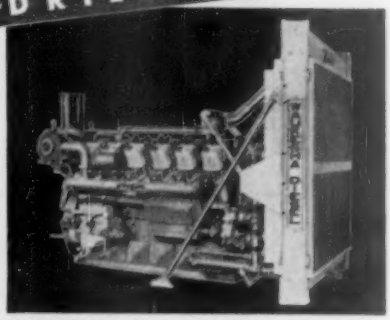
It gives complete line of Waukesha Oil Field Engines for gas, gasoline, normal Diesel, or turbocharged Diesel operation—to 1135 hp.



WAUKESHA MOTOR COMPANY
WAUKESHA, WISCONSIN
New York • Tulsa
Los Angeles

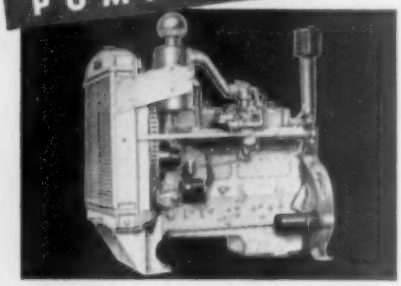
253-R

DRILLING



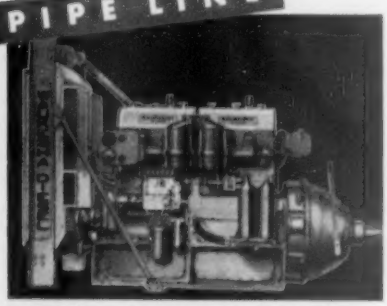
VLRDBSU Turbocharged Diesel Unit—twelve cyl., 8½-in. bore x 8½-in. stroke, 5788 cu. in. displacement, 1100 hp at 1200 rpm, maximum.

PUMPING



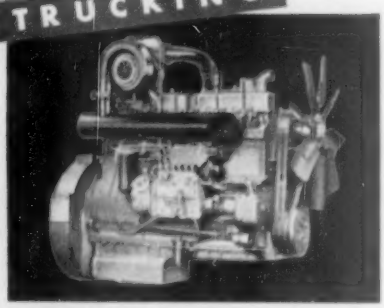
145-GZBU Gas Power Unit—six cylinders, 5¾-in. bore x 6-in. stroke, 817 cu. in. displacement, 176 hp at 2000 rpm on natural gas.

PIPE LINE



NKDBU Normal Diesel Power Unit—six cylinders, 7-in. bore x 8¼-in. stroke, 1905 cu. in. displacement, 274 hp at 1200 rpm, maximum.

TRUCKING



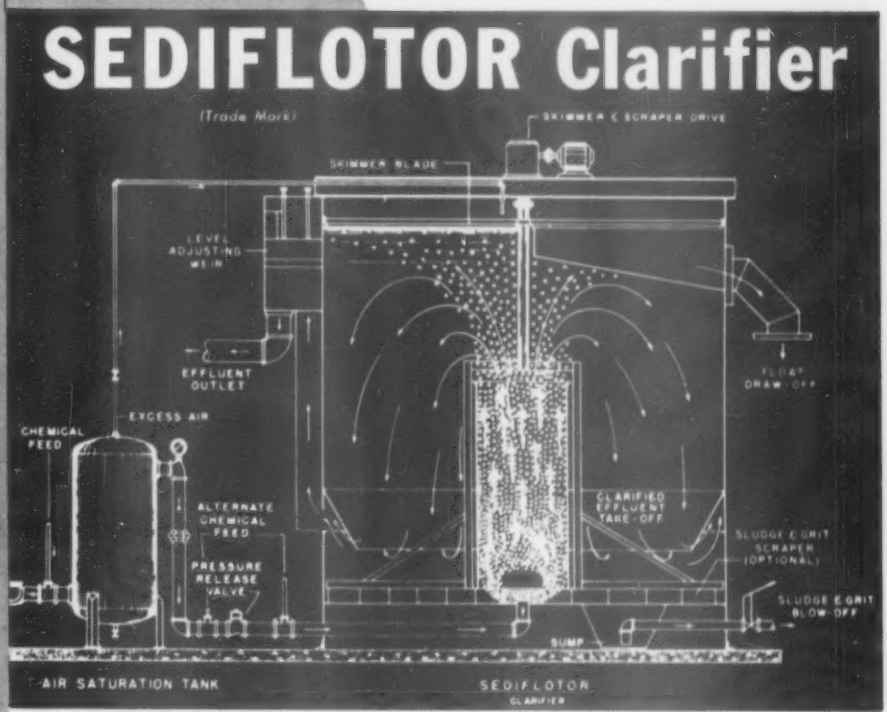
148-DKBS Turbocharged Truck Diesel—six cylinders, 5¼-in. bore x 6-in. stroke, 779 cu. in. displacement, 280 hp at 2100 rpm.

NOW INFILCO ...LEADER IN WASTE-TREATMENT EQUIPMENT ENGINEERING presents the

SEDIFLOTOR Clarifier

(Trade Mark)

versatile new 2-in-1 flotation unit



1. "DISSOLVED-AIR FLOTATION" assures rapid removal of suspended material from waste waters. Here is new efficiency for removing contaminants such as oils, greases, light fibrous materials, etc. Based on the principle of "dissolved-air flotation"— and incorporating reliable chemical feed and operating control, the "SEDIFLOTOR" Clarifier is the answer to many waste problems.

2. GRAVITY-SETTLING CLARIFICATION is included. "SEDIFLOTOR" Clarifier design provides the most modern type of gravity-settling equipment, so that both light and heavy materials are removed rapidly and effectively.

Faster...flexible...economical...dependable

Proved by exhaustive test, "SEDIFLOTOR" Clarifier offers marked advantages. The combination of flotation and gravity-settling results in extremely fast and efficient cleansing of waste waters from refineries, packing houses, paper mills, sewage plants (where large amounts of grease and oil are present), chemical and food plants and other similar sources.

It is readily adaptable for use with other equipment, and may be designed for literally any desired flow, with provisions for use of chemical agents, and continuous removal of floating scum and settleable solids.

Quite automatic, the "SEDIFLOTOR" Clarifier operates with maximum economy and requires only periodic attention.

Waste Samples Invited

Our laboratory is equipped to test samples of waste water to determine suitable methods and proper size of equipment for your needs. Your inquiry is invited and should include general description of your problem.

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The one company offering engineered equipment for all types of water and waste processing—coagulation, precipitation, sedimentation, flotation, filtration, ion exchange and biological treatment.

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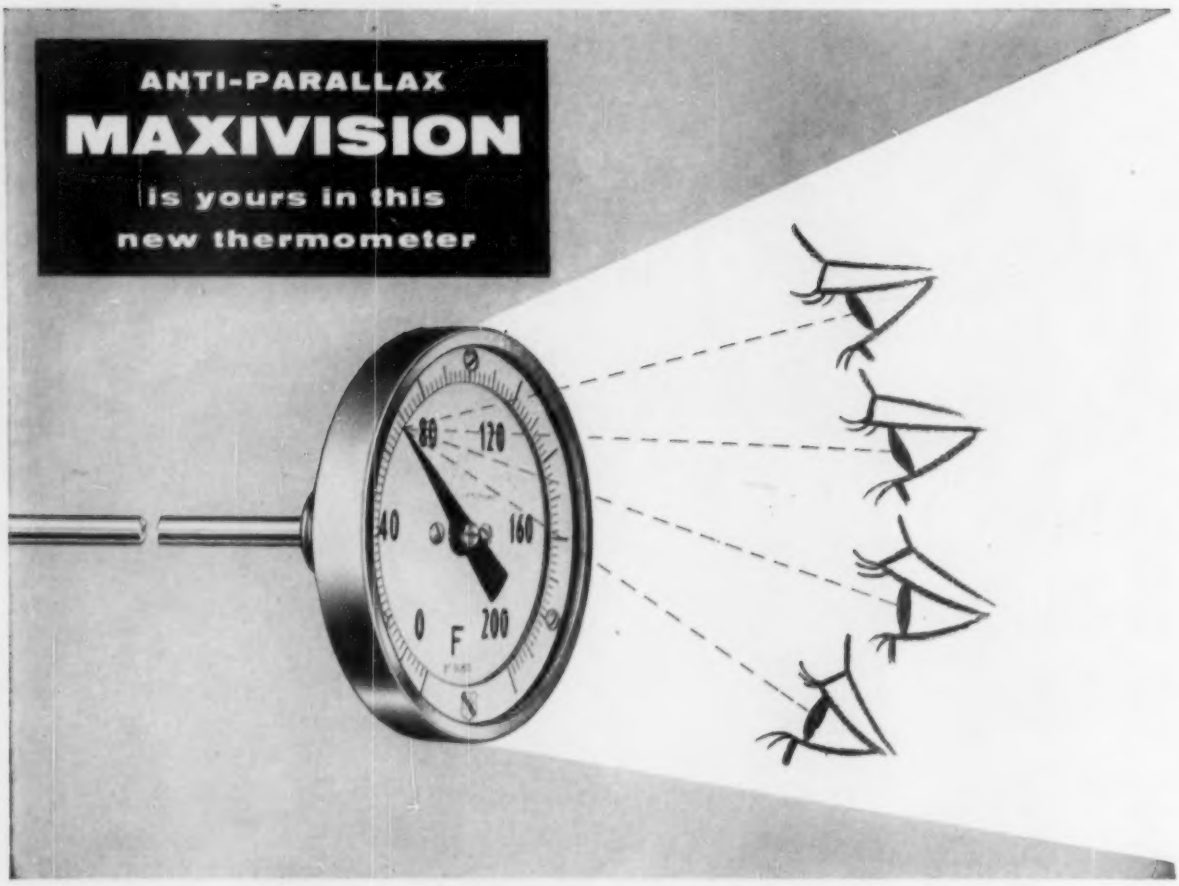

Now you can read temperatures *right at the process* with the same ease, accuracy and economy as pressure readings. The Anti-Parallax Maxivision Dial on this new all stainless steel American Bi-Metal Thermometer assures these important advantages. The large, easy-to-read black figures and graduations are carried on a raised ring set close to the glass, with pointer at the same level. Parallax error is practically eliminated.

With this new thermometer in service, field operators can eliminate frequent trips to the control house to observe process changes. Indoors or outdoors, this fine, all stainless steel American instrument is truly climate-proof. Because the case is only 3" in diameter, the thermometer fits where space is limited. Ample clearance behind the case makes installation easy and fast with a small wrench. Read the specification highlights, then get full details about this new high-accuracy American Bi-Metal Thermometer.

PHONE your Industrial Supply Distributor for prompt attention to your needs. He is always ready to help keep your production going by making fast delivery from local stocks.

SPECIFICATIONS

New AMERICAN ALL-STAINLESS STEEL BI-METAL THERMOMETER with ANTI-PARALLAX MAXIVISION DIAL

Dial: Exclusive anti-parallax Maxivision dial, with scale approximately 6" long. Pointer set at same level as scale.

Climate-Proof Case: All stainless steel. 3" diameter. Threaded bezel. Selected clear, extra-heavy cover glass. Heat-resistant gaskets between glass and case seal the thermometer against rain, frost, sand, dust, fumes—climate-proof.

Temperature Ranges: From minus 80° to plus 1000° F. Accuracy within 1% of range.

Low-Mass Bi-Metal Coil: Welded to stem plug. Accurately centered in stem. Non-freezing, non-corrosive silicone fluid on coil dampens vibration, accelerates heat transfer, speeds response; does not gum, resists capillary action.

Pointer: Index type. Easily accessible from front of dial for positive adjustment over entire range. Pointer shaft guided by friction-free bearings.

Stem: 18-8 stainless steel, mirror polished. All joints welded. Resists corrosion. Provides strong, rigid and tight closure against process pressures. Lengths: 2½" to 24".

Connection: Fixed, ½" N. P. T.

Separable Sockets: Available for use in closed systems or where measured medium is corrosive to the stainless steel stem. Fit over all standard stem lengths except 2½".

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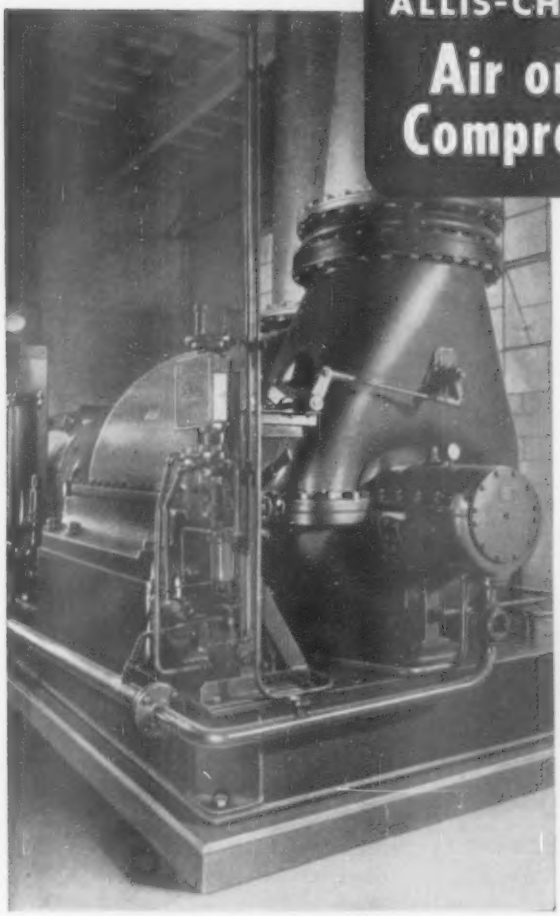
A product of **MANNING, MAXWELL & MOORE, INC.** STRATFORD, CONNECTICUT

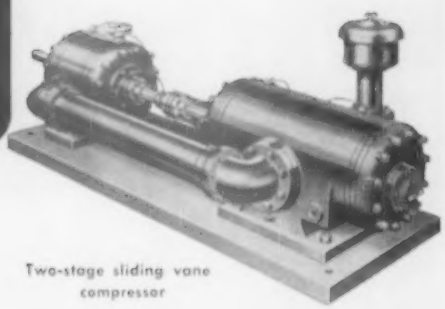
MAKERS OF 'ASHCROFT' GAUGES, 'AMERICAN-MICROSEN' INDUSTRIAL ELECTRONIC INSTRUMENTS, 'CONSOLIDATED' SAFETY AND RELIEF VALVES, *Stratford, Conn.* HANCOCK VALVES, *Watertown, Mass.* 'CONSOLIDATED' SAFETY RELIEF VALVES, *Tulsa, Oklahoma.* AIRCRAFT CONTROL PRODUCTS, *Danbury & Stratford, Conn. and Inglewood, Calif.* "SHAW-BOX" AND 'LOAD LIFTER' CRANES, 'BUDGIT' AND 'LOAD LIFTER' HOISTS AND OTHER LIFTING SPECIALTIES, *Muskegon, Mich.*

ALLIS-CHALMERS

Air or Gas Compressors

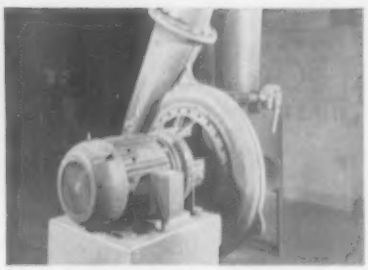


Four-stage motor-driven regenerator air compressor rated 28,000 cfm inlet volume at 26 psig discharge pressure.



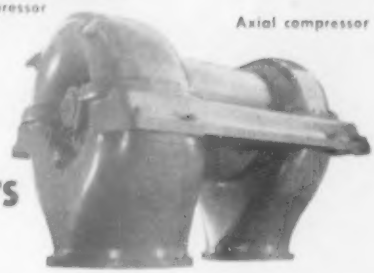
Two-stage sliding vane compressor

Any Volume Any Pressure



Single-stage centrifugal compressor

Axial compressor



Solve every process air or gas need from the most complete line of compressors

Whether you need main blowers, regenerator air, lift air, recycling, or vacuum pumps, Allis-Chalmers builds a type and size unit for the job.

Compressors that have run over two years without stopping have established Allis-Chalmers reputation for reliability in the petroleum industry.

One reason for such performance records is the smooth operation of Allis-Chalmers compressors . . . proof of careful engineering and manufacture. In addition, casings are rugged cast iron or steel, bearings are ample size and easily accessible for inspection and maintenance.

You need uninterrupted service and you get it with Allis-Chalmers compressors.

If motor-driven units are specified, Allis-Chalmers can furnish motors specially designed for petroleum industry applications, together with coordinated control.

CHECK HERE FOR INFORMATION

- ☐ Single-stage sliding vane compressors
- ☐ Two-stage sliding vane compressors
- ☐ Single-stage centrifugal compressors
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- ☐ Axial compressors

Add name and address in margin and send to your nearby A-C office or Allis-Chalmers, Milwaukee 1, Wis.

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A-4751

TAKE OVER THESE

POWER CONTROLS

FOR GREATER OPERATING EASE

... FASTER RESPONSE

Presenting the NEW 26 LORAIN PIPELINER

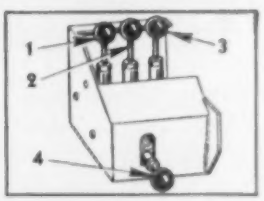
Mr. Pipeliner . . . you asked for it! This new "Power Controlled" Lorain-26 Pipeliner has everything you have wanted in a more powerful, faster digging, easier operating Hoe. Now, new "E-Z" action operating levers reduce operator effort by 70%. Now, Hydraulic Power goes to work (see right) on all crawler controls. Now, the new "26" brings you a longer, stronger hoe boom; newly designed, sturdier, wider 2-speed crawlers with 29-inch treads. Throughout the "26" there's new power, new clutches for operating ease and long life.

Investigate the new Lorain-26 Pipeliner now . . . plan to put it on your next pipeline job. Your Thew-Lorain Distributor can give you the big, new story in detail!

THE THEW SHOVEL CO., LORAIN, OHIO

NEW... Hydraulic Power Crawler Controls

Here's more operating ease and quicker response in the new Lorain "26". From the operator's cab — with turntable in any swing position — the operator simply flicks these levers — and these actions take place immediately . . .



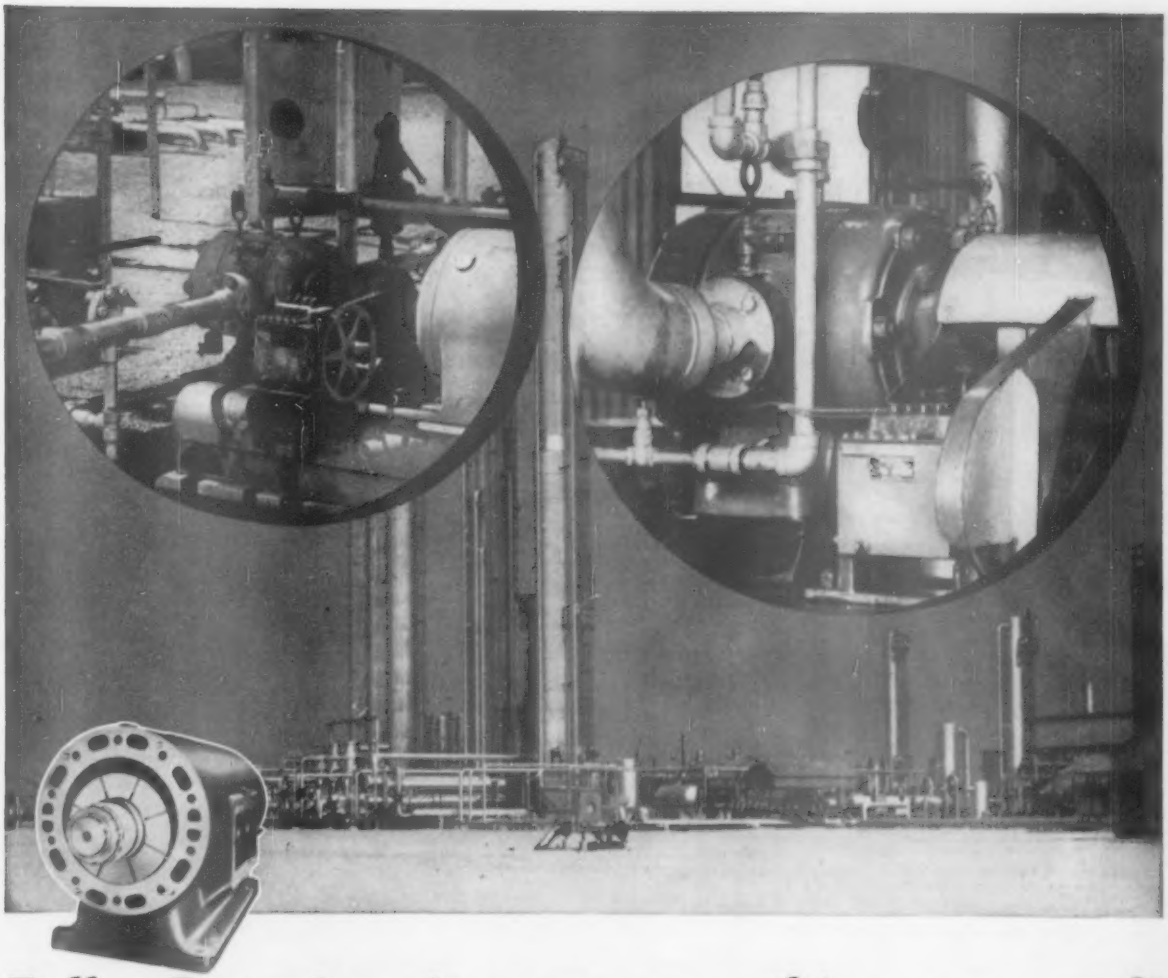
1. HOUSE LOCK is engaged promptly by power and released instantly by this handy, easy-acting lever, to prevent side motion of turntable.

2. SWING AND TRAVEL JAW CLUTCHES are selected and engaged by simply flipping this lever . . . push forward to travel . . . pull back lever to swing.

3. LOCKING PAWLS, now fully enclosed and mud protected, are instantly engaged and released by fast-acting power.

4. CRAWLER STEERING is power controlled by a single short lever — no operator effort, no fatigue. Either right or left steering is effected while traveling forward or backward, with turntable in any position of swing.

THEW-LORAIN. 26 PIPELINER



Fuller Rotaries give you everything you need!

ADVANTAGES OF:

- Direct Drive
- Accessibility
- Low Maintenance
- Simple foundations
- Blades automatically compensate for wear
- Maintained capacity for the life of the machine

ELIMINATION OF:

- Bearing take-up
- Unnecessary bulk
- Air-line pulsations
- Large space requirements
- Leaking valves—Grinding seats
- Multiplicity of parts requiring frequent attention, adjustment, and replacement

Fuller Rotary Compressors are used wherever reliability and low maintenance are important.

Illustrated, upper left is a Fuller Rotary Single-stage propane-vapor booster, having a capacity of 55 c.f.m. referred to intake condition of 225-lb. gage (895 free c.f.m.) compressing to 250-lb. gage discharge, operating at 1160 r.p.m. Illustrated on right, Fuller Single-stage gasoline-vapor booster, capacity of 173 c.f.m. referred to intake condition of 75-lb. (1055 free c.f.m.) compressing to 175-lb. gage discharge, operating at 1000 r.p.m.

Fuller Rotary Compressors in the refinery for general plant air, purging gas, recycling, and handling butane-butylene, as well as in the field for pressure boosting and gas gathering, have proved their worth, as is evidenced by the many machines in daily use in practically every oil-producing section of the country.

Simplicity of construction has proved to be one of the important factors . . . the only moving parts being the rotor, bearings, and blades. No valves to leak, no seats to grind, results in maintained capacity for the life of the machine. A simplified direct drive eliminates power transmission losses. For further information, write to

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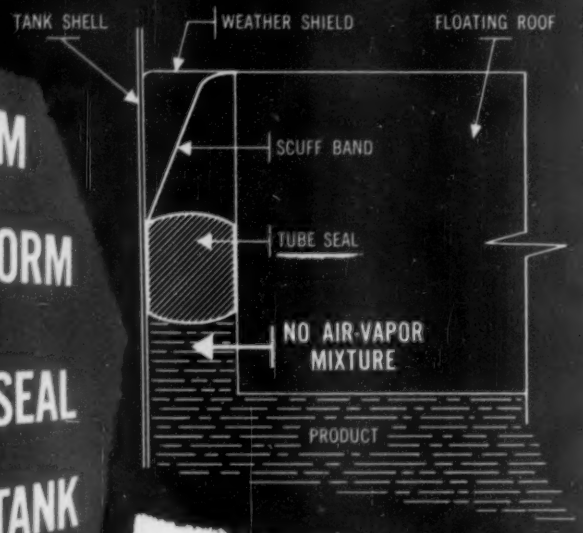
THERE'S NO ROOM FOR VAPOR TO FORM IN A HAMMOND TUBESEAL FLOATING ROOF TANK



The Hammond Tubeseal Floating Roof is different from all other floating roofs because its design and construction does not provide space where air-vapor mixtures can form.

All floating roofs now in general use, except the *Hammond Tubeseal*, provide a space between the shell of the tank and the outer rim of the roof where air-vapor mixtures form.

If a sour crude is stored in a conventional floating roof tank, excessive corrosion of the tank shell and rim plates will occur where air-vapor mixtures form. Unless the metal shoes and flexible fabric covers provide an absolutely gas-tight housing, some of the vapor will be lost. If the stored product is of intermediate volatility such as jet fuel (JP-4 grade) combustible vapors will exist in this space under all normal atmospheric temperature ranges. Any ignition as from lightning will cause violent combustion.

The Hammond Tubeseal eliminates this space and prevents the forming of any air-vapor mixture. Corrosion is stopped even for sour crudes. Jet fuels such as JP-4 grade may be stored with assured safety from rim fires. *Vapors which cannot form cannot ignite or be lost.* There is no room where vapor can form in a Hammond Iron Works Tubeseal Floating Roof.

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LACY MFG. CO., LOS ANGELES

HAMMOND TUBESEAL COSTS NO MORE IN THE FIRST PLACE

The most efficient and positive seal known.

no moving parts • no mechanical maintenance • overcomes tank out-of roundness • climate proof • non-corrodible • can operate to bottom of tank or above the top • no vapor space below the seal • entire circumference has tight seal under pressure at all times.

CHEAPER OVER THE YEARS

HAMMOND IRON WORKS
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NOW YOU CAN GET

Two Services for the Price of One

THE SCHLUMBERGER MICROLOG + THE SCHLUMBERGER SECTION GAUGE

= THE SCHLUMBERGER

MICRO LOG / CALIPER SURVEY

Here's another first for Schlumberger — A Caliper run simultaneously with the MicroLog at **no extra cost** to the client. Two services made on one run for the price of the MicroLog only.

The ability of the MicroLog to indicate porous zones and accurately define thin beds has been well established. The addition of the Caliper to the MicroLog provides other valuable information to determine casing and packer points, cement volumes and mud cake thickness, and it aids materially in better log interpretation.

No added rig time — no added costs. Don't just ask for a MicroLog — ask for a Schlumberger MicroLog-Caliper

See your local Schlumberger engineer about this new service.

SCHLUMBERGER
Well Surveying Corporation
THE EYES OF THE OIL INDUSTRY

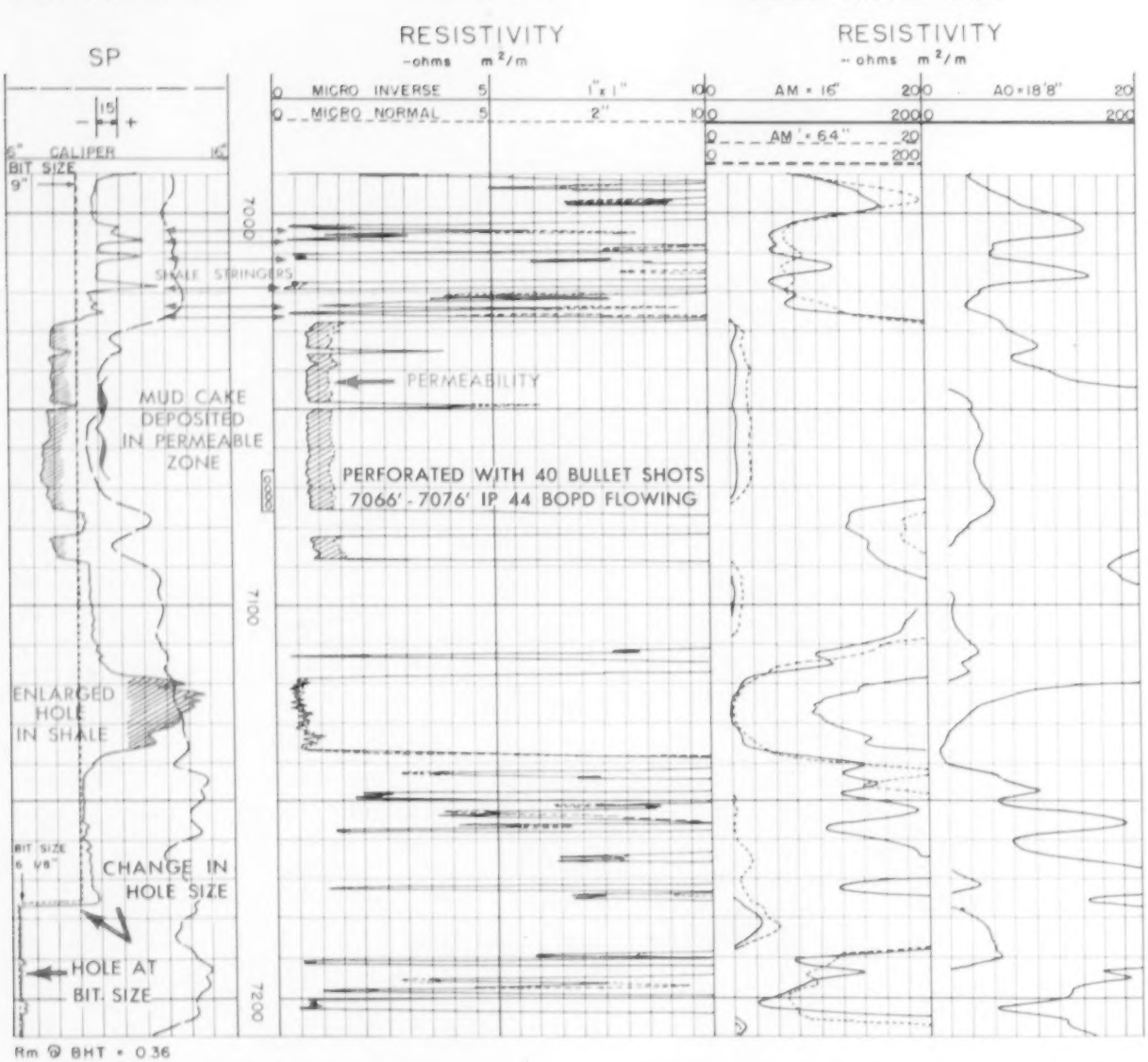
SEE FIELD EXAMPLE ON OTHER SIDE

2 SERVICES FOR THE PRICE OF ONE

with { **NO ADDED RIG TIME**
NO ADDED COSTS...

The SCHLUMBERGER

MICRO LOG / CALIPER SURVEY

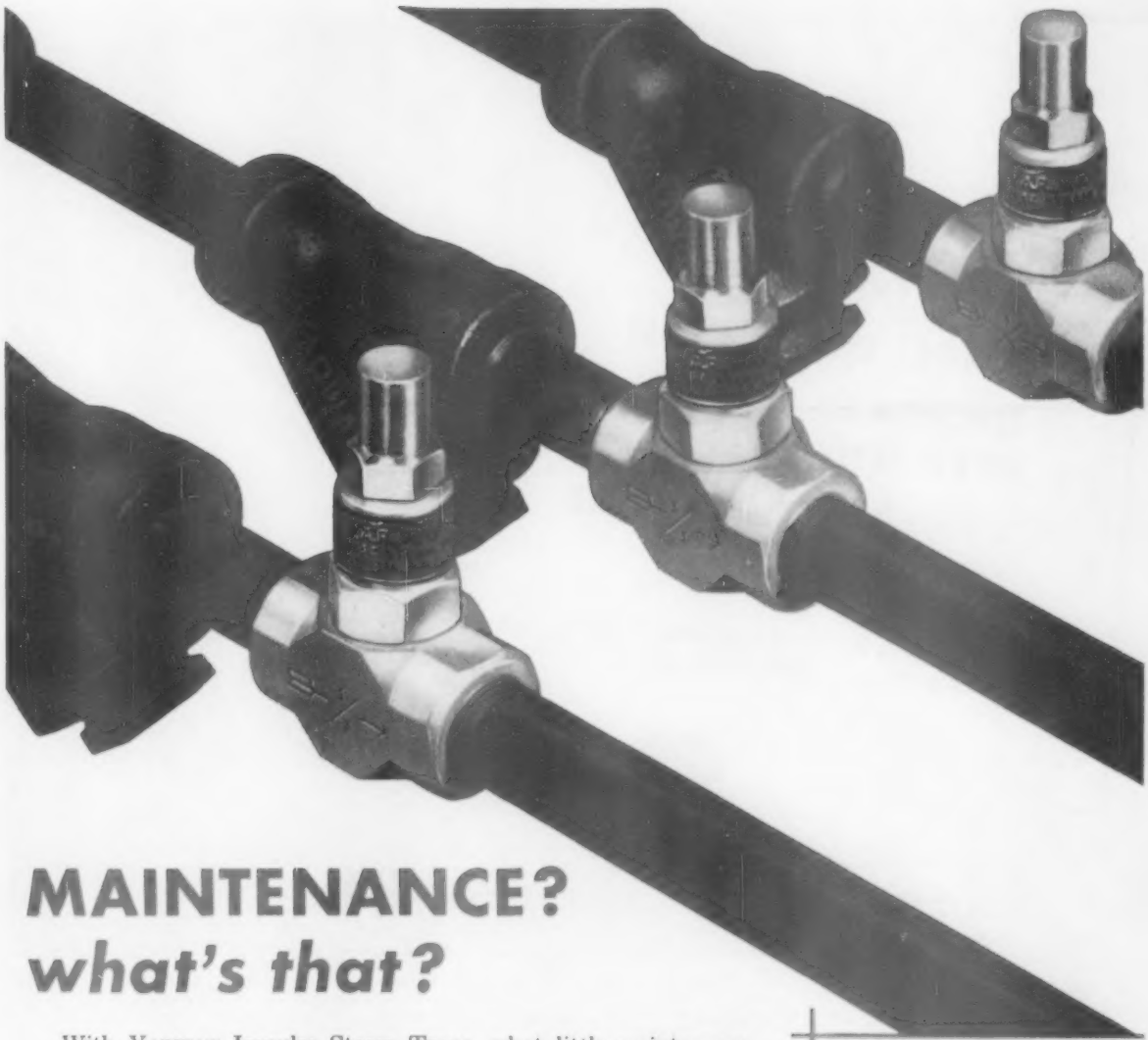


The example above is of an East Texas well which was completed in the upper Rodessa of lower Cretaceous Age. The well was perforated from 7066'-7076' with 40 bullet shots. Initial production was 44 BOPD. Average porosity from core analysis in the section 7066'-7076' is 18%. Permeability for the same zone averaged 14 md. and the water saturation averaged 24%.

The example illustrates the ability of the Microlog to locate porous permeable zones. The movement of the pads against the borehole face also gives a MicroCaliper that confirms mud cake deposition in permeable zones and indicates caving sections such as may be present in shales and other hole conditions important to the completion of the well.

THE EYES OF THE OIL INDUSTRY **SCHLUMBERGER**

SCHLUMBERGER WELL SURVEYING CORPORATION • HOUSTON



MAINTENANCE? *what's that?*

With YARWAY Impulse Steam Traps, what little maintenance there is can be handled in a jiffy. There's only one moving part—a tiny valve.

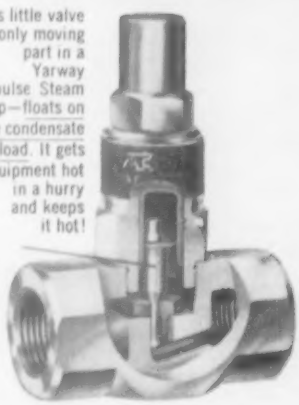
When the trap must be cleaned or repaired, it can be done right in the line—in a matter of minutes.

Other YARWAY features:

- **Stainless steel—body and internal parts.**
- **Gets equipment hot in a hurry—and keeps it hot.**
- **Good for all pressures without change of valve or seat.**
- **Easy installation—small size, light weight.**
- **Non-freezing at low temperatures.**
- **Six standard sizes, ½" to 2".**

Want proof of performance? Try a YARWAY Impulse Trap and Fine Screen Strainer FREE for 90 days in your own plant. For free trial or free catalog, write . . .

YARNALL-WARING COMPANY, 136 Mermaid Ave., Philadelphia 18, Pa.



This little valve—only moving part in a Yarway Impulse Steam Trap—floats on the condensate load. It gets equipment hot in a hurry and keeps it hot!

YARWAY **impulse steam trap**

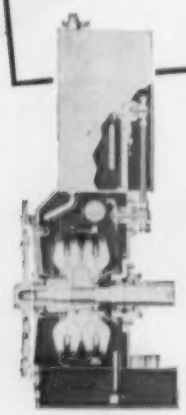
OVER 1,000,000 YARWAY IMPULSE TRAPS SOLD—STOCKED BY 270 CONVENIENT INDUSTRIAL DISTRIBUTORS

"Twin Disc Model HUD Fluid Power Take-Offs

- **'EASE' OPERATION**
- **INCREASE RIG EFFICIENCY**
- **LOWER MAINTENANCE COST!..."**

Says John S. Hagestad, owner of Hagestad Drilling Company, Bakersfield, Calif.

Emsco GB-350 Drilling Rig, owned by Hagestad Drilling Company, is driven 100% through Twin Disc Drives. In addition to the Model HUD's, Twin Disc Air-Actuated Clutches are used throughout—with Model P-318's as *master* clutches on the drawwork; Model P-224's as drum clutches, and Model P-314's controlling the rotary tables.



Model HUD Disconnecting Fluid Power Take-Off

Faster, cheaper drilling is the watchword of drillers who are getting the contracts today. That's why more and more rig owners specify Twin Disc Model HUD Disconnecting *Fluid* Power Take-Offs on new equipment.

Typical is Mr. John S. Hagestad, owner of the Hagestad Drilling Company, Bakersfield, California, who reports: "A year ago, we installed Twin Disc HUD Disconnecting Fluid Power Take-Offs on the Model 220-G Murphy Diesel Engines powering our Emsco GB-350 rig. The ease of operation since this installation has been very gratifying. This is noticeable because we operated this rig for one year before installing the Twin Disc fluid couplings.

"To date our maintenance cost has been very low. The HUD has increased rig efficiency . . . also lowered our entire maintenance problem. We find that through full range of throttle there is positive control of drawworks and rotary table."

With this advanced design in fluid drive, *you too* can make hole faster—at less cost per foot.

The HUD picks up the load smoothly, utilizes peak output of torque from any type gas or diesel engine and increases speed ranges.

The Twin Disc HUD also dampens out starting shocks and overloads—isolates vibrations—prevents engine lugging and stalling—reduces impact shocks up to 70% on both driving and driven equipment.

For the complete story, write *now* to Twin Disc Clutch Company, Hydraulic Division, Rockford, Ill.—and see your Authorized Hydraulic Dealer.

TWIN DISC

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Friction Clutches and Fluid Drives

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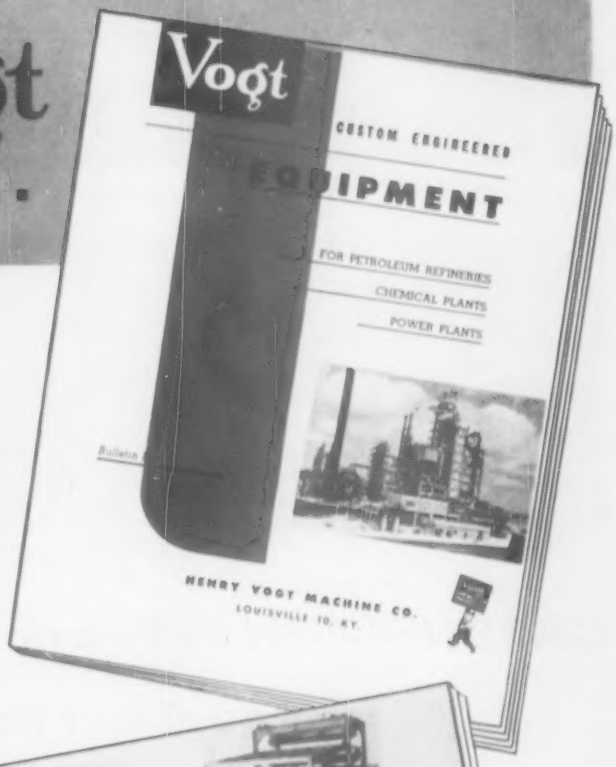

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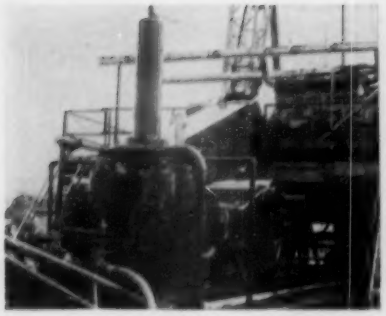
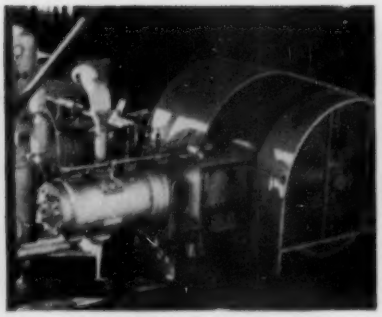
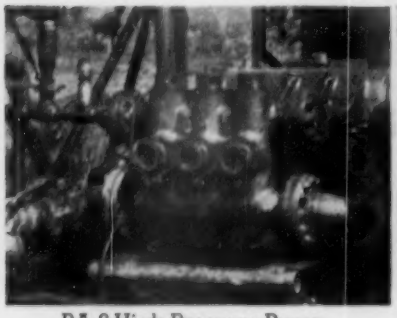


Power Mud Pumps

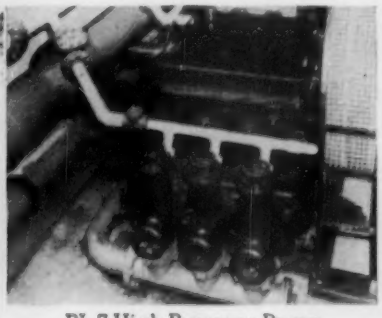


Gas Booster Compressors

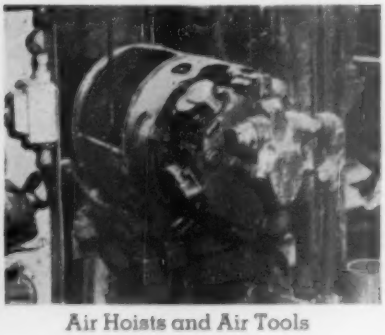
Portables for Air Drilling



PA-8 High-Pressure Pump



PL-7 High Pressure Pump



Air Hoists and Air Tools

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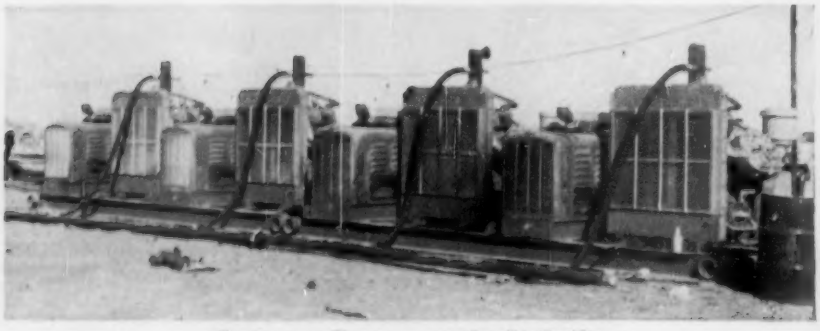
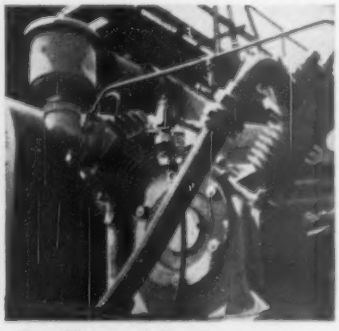


Stationary Compressors for Air Drilling



Rig-Mounted Air Compressors

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Nothing beats a LANE-WELLS Drillable-Wireline BRIDGING PLUG

on any of these jobs

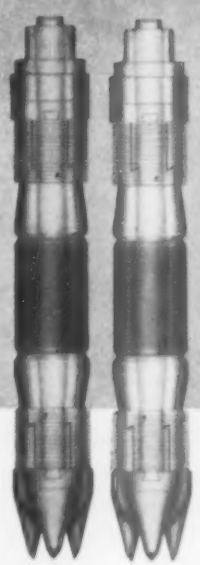
abandonment
(cast iron—it will outlast the casing)

testing multiple zones
(magnesium—for fastest possible drill out—1 to 3 hours)

upper zone testing and completion
(magnesium or cast iron)

squeeze operations
(cast iron—in view of higher pressures)

false bottom
(cast iron, usually)



nitro tamping
(magnesium or cast iron)

casing recovery
(magnesium or cast iron)

CAST IRON MAGNESIUM

Both plugs run in on wire line, running fast through fluid, and give leak-proof packoff against pressures up or down—magnesium to 6,000 p.s.i., cast iron to 10,000 p.s.i. The cast iron plug drills out quickly, with either rotary or cable tools. When light weight rotary equipment is used, the magnesium plug has the advantage in drill-out time.

Tomorrow's Tools—Today!

LANE WELLS COMPANY

UL-81-A

General Offices, Export Office and Plant • 5610 So. Soto St. • Los Angeles 58, California

Los Angeles • Houston • Oklahoma City • Lane-Wells Canadian Co. in Canada • Petro-Tech Service Co. in Venezuela

JONES
SUCKER RODS
last longer!

LOOK FOR THE GREEN RODS

Years of Experience plus "Know Why" pays you dividends

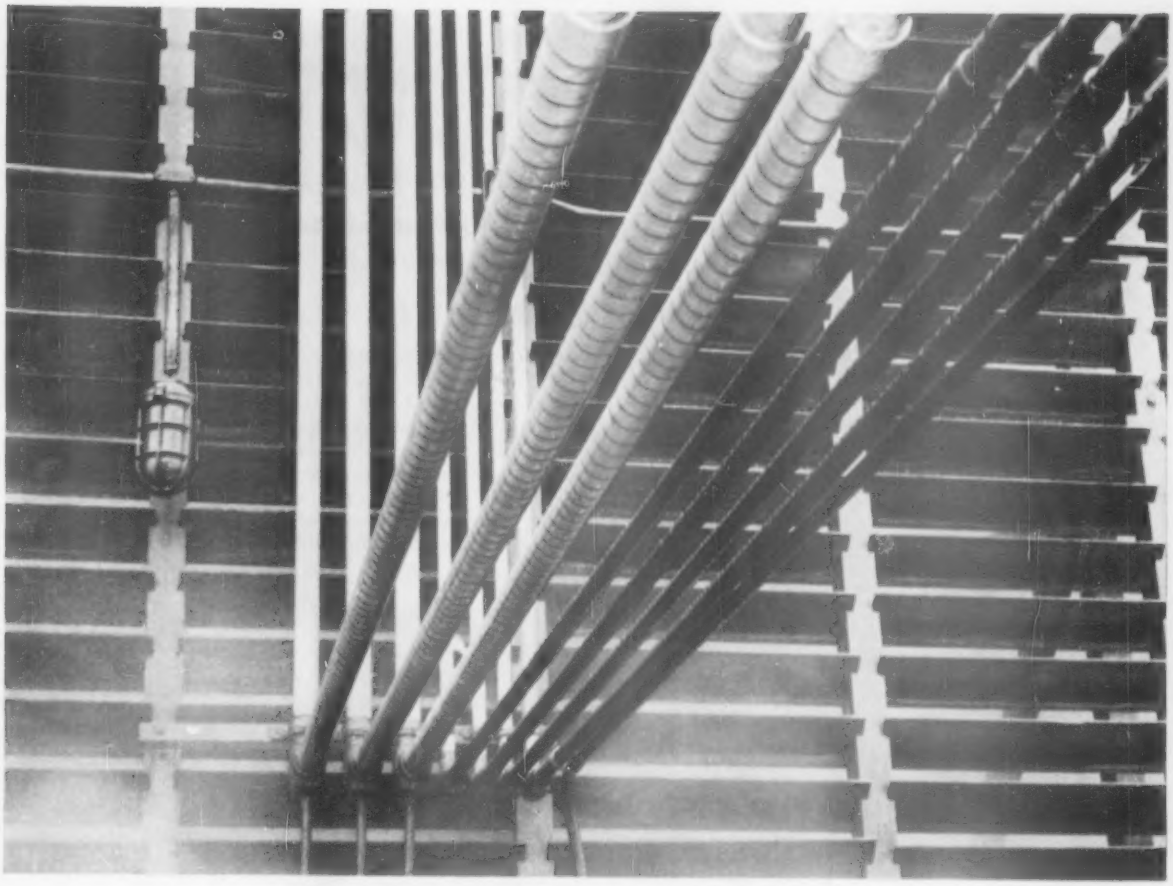
Our specialized factory experience in turning selected steel into accurately machined sucker rods with improved physicals provides the "know how."

Our field engineering experience through the scientific approach to problems of sucker rod application, with the cooperation of producers, has added the important "know why."

The result: The right rods correctly selected to do the lob for which they are made...with the greatest efficiency and economy.

PESA
PETROLEUM EQUIPMENT SUPPLIERS ASSOCIATION
PARTNERS IN PETROLEUM PROGRESS

THE S. M. JONES COMPANY
Division of Buffalo-Eclipse Corporation
General Office and Factory: **TOLEDO, OHIO**
Sales Office: Kennedy Building, **TULSA, OKLAHOMA**



Polyken® Protective Coating keeps this conduit safe from corrosive attack of chemically treated water

Rugged Polyken Tape has prevented corrosion damage here since 1951

The conduit pictured above is installed on a water cooling tower serving one of the world's largest fluid catalytic cracking units at Gulf Oils, Port Arthur, Texas Refinery.

If it were unprotected, the conduit would soon be destroyed by corrosion. But *Polyken* Protective Tape Coating has been on the job for 4 years, providing dependable protection. What's more, *Polyken* Tape shows no sign of deterioration.

Polyken Protective Coatings are tough plastic tapes. They're manufactured from controlled raw materials under controlled conditions. They offer high resistance to corrosive atmospheres at varying temperatures. Thickness and composition of the polyethylene backing and adhesive mass are consistent.

Polyken Protective Coatings go on quickly and economically right from the roll. No heat, no solvents or thinners, no drying or clean-up time required.

Get all the facts by sending the coupon now.

Polyken®

CONTROLLED STRENGTH

PROTECTIVE COATINGS

Polyken Products Department of The Kendall Company

Polyken, Dept. OG-G
Department of The Kendall Company
222 West Adams St., Chicago 6, Illinois

Please send me samples and further information on *POLYKEN* PROTECTIVE TAPE COATINGS.

Name_____ Title_____

Company_____

Street Address_____

City_____ Zone____ State_____

2 BIG REASONS WHY MAJOR PIPELINES

1 Low Maintenance

Bingham Pipeline Pumps are of "Double Volute" design, insuring perfect radial balance of the rotating element. This "Hydraulic Radial Balance" eliminates the unequal pressures on the shaft that are the primary cause of wear and maintenance in conventional pumps.

"Double Volute" design also makes possible a more compact multi-stage design, resulting in reduced load on case boltings. Dual-stage cross-overs, *possible only* with "Double Volute" construction, reduce the axial space between stages, effectively decreasing the overall length of the pump shaft and the span between main bearings. All this adds up to *low maintenance* and trouble-free service.

Long Seal Life . . . "Hydraulic Radial Balance" eliminates shaft deflection, permitting mechanical seals to establish and maintain a uniform "Track" between the contacting faces.

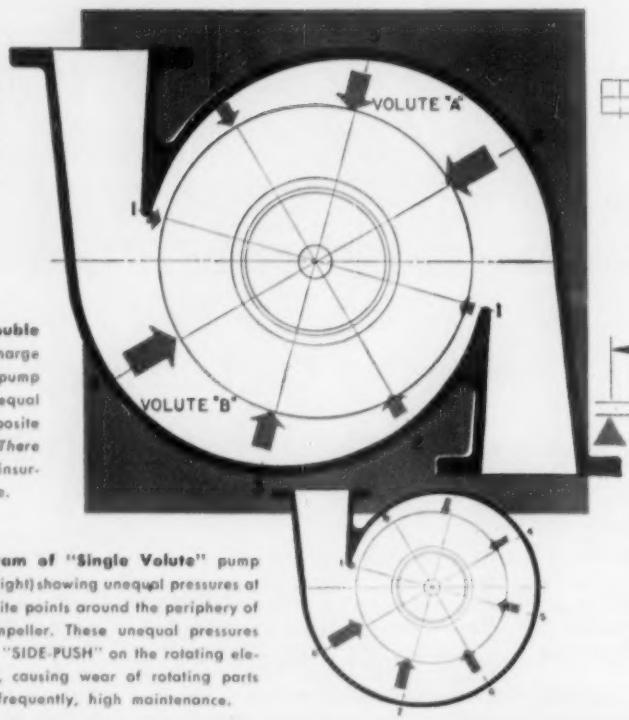
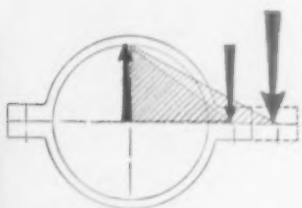
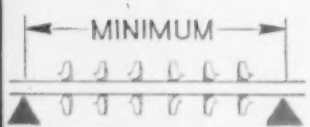


Diagram of a "Double Volute" double discharge case of a multi-stage pump (right) showing the equal pressure on the opposite sides of impeller. *There is no* "SIDE-PUSH", insuring low maintenance.



Greater Compactness in multi-stage "Double Volute" design reduces load on case bolting.



A Wide Range of Operating Speeds Is Possible because "Double Volute" construction reduces the overall length of pump shaft and the span between the main bearings.

Diagram of "Single Volute" pump case (right) showing unequal pressures at opposite points around the periphery of the impeller. These unequal pressures cause "SIDE-PUSH" on the rotating elements, causing wear of rotating parts and, frequently, high maintenance.

NEW MAJOR PIPELINES *recently placed into operation equipped with Bingham "Double Volute" pumps:*

Interstate's Southern Main Pipeline
Kaneb Pipe Line
Mackinac Pipe Line
Magnolia's Reinggold Pipeline
Trans-Mountain Pipeline
Trans-Northern Pipeline
Tuscarora Pipe Line
Standard Oil of Indiana Pipelines:
1. **Dubuque—Moorhead Pipeline**
2. **Mandan—Moorhead Pipeline**
3. **Whiting—River Rogue Pipeline**

NEW MAJOR PIPELINES *under construction being equipped with Bingham "Double Volute" pumps:*

Cherokee Pipeline
Great Lakes Pipeline
Interprovincial Pipeline
Lakehead Pipeline
Pembina Pipeline
Pemex Pipeline
Western Pipeline
Minnesota Pipeline
Oklahoma-Mississippi River Pipeline
Brazilian Gov't Pipeline
Service Pipeline
Sun Pipeline
Southern Pacific Pipeline

THESE ARE ONLY A FEW OF THE MAJOR PIPELINES BEING SERVED BY BINGHAM PUMPS TODAY

SELECT *Bingham*

"DOUBLE VOLUTE" PUMPS

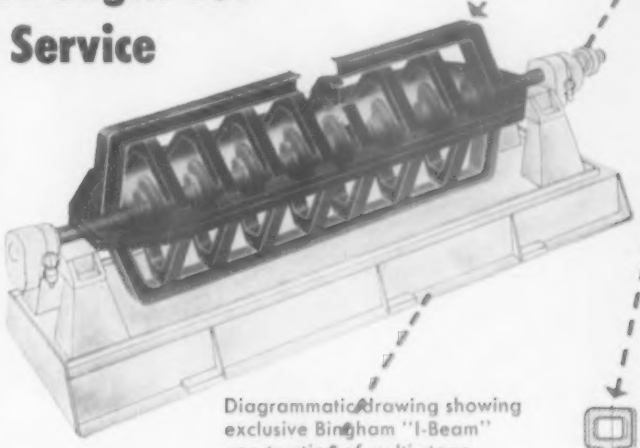
I

2

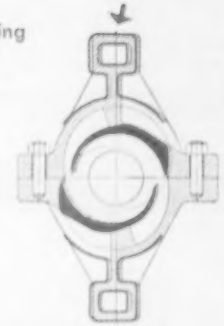
Assured Case Strength for High-Pressure Service

Integral cross-overs in Bingham "Double Volute" multi-stage pumps produce casings of maximum strength for high pressure service because each cross-over is cast integrally with its half of the pump casing, and thereby becomes a structural member of Bingham's "I-Beam Truss Construction".

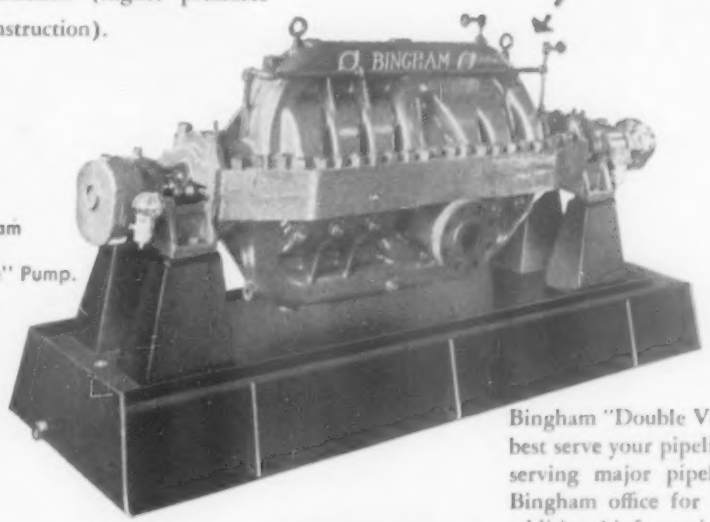
This feature, found only in Bingham pumps, increases the strength of the pump casing to such an extent that it can safely withstand pressures up to 2000 psi with standard construction (higher pressures with special construction).



Diagrammatic drawing showing exclusive Bingham "I-Beam" construction of multi-stage "Double Volute" pump.



A transverse cross-section of Bingham "Double Volute" Multi-Stage Pumps, showing identical cross-overs cast integrally with the upper and lower halves of the pump casing.



Typical Bingham Multi-Stage "Double Volute" Pump.

Bingham "Double Volute" Multi-Stage Pumps will best serve your pipeline operations, as they are now serving major pipelines. Write to your nearest Bingham office for "Double Volute" Bulletin or additional information.

Bingham SINCE 1921

DOUBLE VOLUTE PUMPS RADIAL BALANCE

BINGHAM PUMP COMPANY

General Offices: **2800 N.W. Front Avenue, Portland 10, Oregon**

Factories: **Portland, Ore. • Vancouver, B.C., Canada**

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SEATTLE, WASH.
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TULSA, OKLA.
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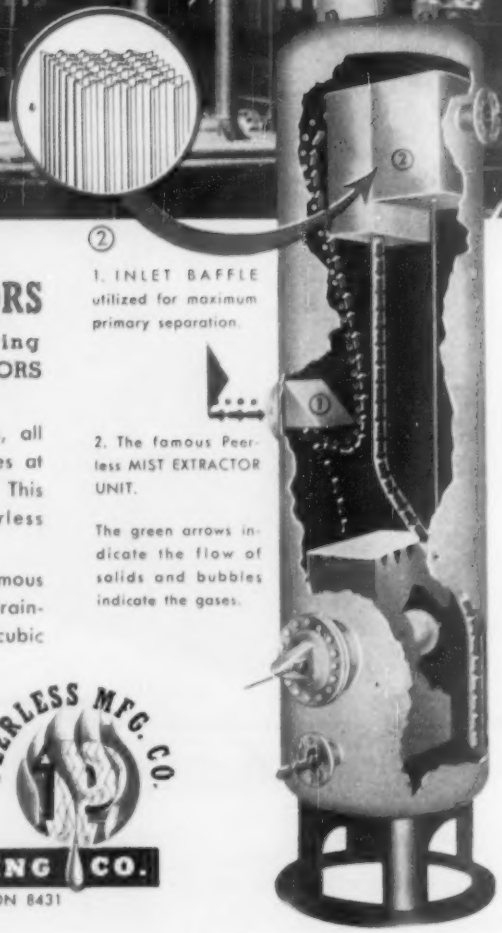
VANCOUVER, B.C., CAN.

PEERLESS SEPARATORS

ALL 9 OF 'EM!



1. INLET BAFFLE utilized for maximum primary separation.

2. The famous Peerless MIST EXTRACTOR UNIT.

The green arrows indicate the flow of solids and bubbles indicate the gases.

PEERLESS OIL and GAS SEPARATORS ARE PERFECT . . . for Pipelines, gathering systems, compressor stations or as INLET SEPARATORS in refineries and petrochemical plants.

NINE big Peerless 24" x 6', 230-lb. pressure Separators, all doing an efficient job of separation of liquids from gases at engine room of main line booster station in West Texas. This is typical of the many successful applications of Peerless Separators.

Each Peerless Separator is designed and built around the famous Peerless Mist Extractor Unit, which guarantees the liquid entrainment loss to be less than 1/10 gallon per million standard cubic feet of flowing gas. The cutaway to the right illustrates the flow of gas through a Peerless Separator and how this Mist Extractor is used.

Write for Separator Bulletin 201

PEERLESS MFG. CO.

PEERLESS MANUFACTURING CO.

P. O. BOX 13165 ★ DALLAS 20, TEXAS ★ DIXON 8431

REPRESENTATIVES IN ALL PRINCIPAL CITIES

New as Tomorrow!

for the important

450-470 mc band...

RCA Carfone FOUR/FIFTY 2-Way Radio

It's all new! It's designed by RCA especially for the important 450-470 mc band! And like other new Carfone equipment it features shadow-box styling in the desk station... compact sectionalized drawer-type mobile equipment... and a triple bonus in its engineering, including:

1. SUPERIOR PERFORMANCE

...thanks to high-efficiency loudspeaker.
...with best frequency stability without ovens.
...operates on 50 kc channels.

2. PROTECTED INVESTMENT

...because of complete 6-12 volt convertibility.
..."Sealed Selectivity" tuned IF filter—anticipates future channel changes.
...operating on any frequency in the 450-470 mc band.

3. LOWER OPERATING COST

...stemming from lowest tube replacement cost, fewest tube types (requiring low tube inventory).
...Rainbow Tuning—color directed, cutting maintenance hours.

"Get the Best!"

RCA DISPATCHER 2-WAY RADIO TO DRIVER

Mail Coupon Below For More Details

RCA

RADIO CORPORATION of AMERICA

COMMUNICATIONS EQUIPMENT CAMDEN, N.J.

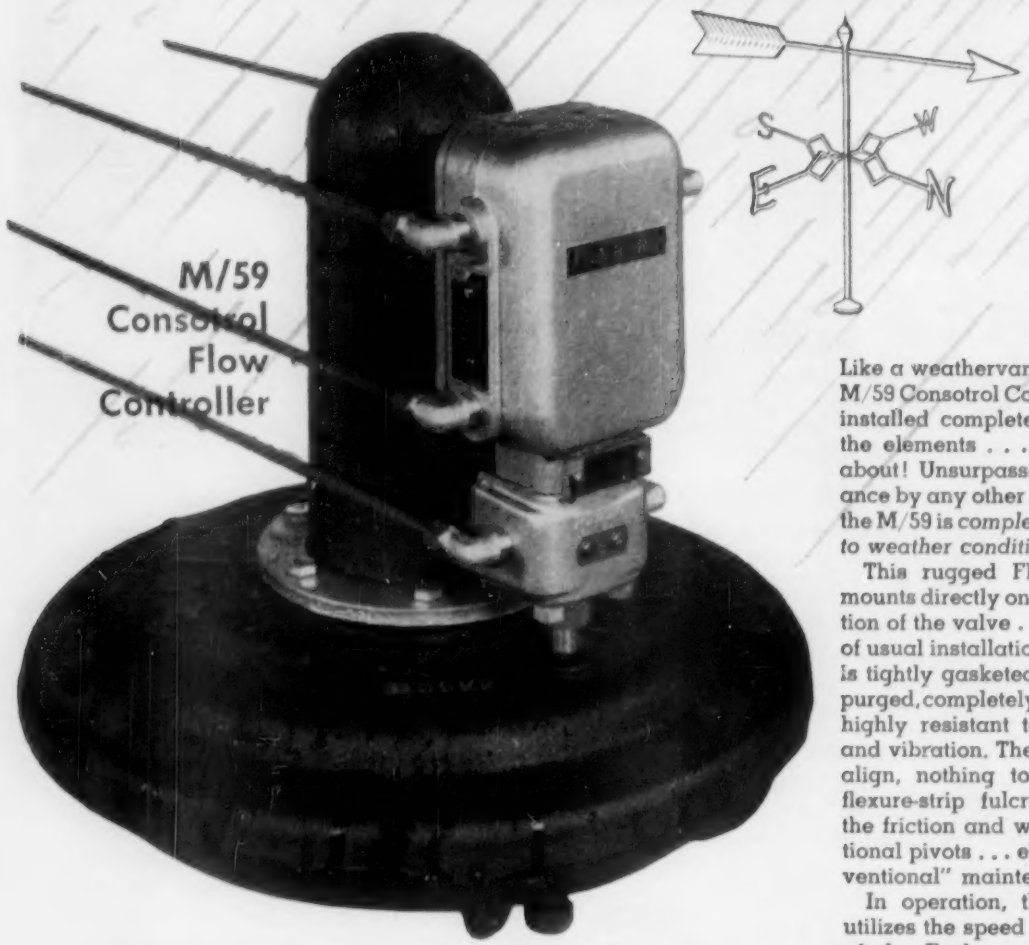
Radio Corporation of America
Communications Equipment
Dept. TD-89, Building 15-1, Camden, N. J.

Please send me information on the new RCA Carfone "450" 2-Way Radio.

Name _____
Title _____
Company _____
Address _____
City _____ Zone _____ State _____

This Controller

requires no more attention than a weathervane!



Like a weathervane, the Foxboro M/59 Consotrol Controller can be installed completely exposed to the elements . . . and forgotten about! Unsurpassed in performance by any other flow controller, the M/59 is *completely indifferent to weather conditions.*

This rugged Flow Controller mounts directly on the air connection of the valve . . . at a fraction of usual installation cost. Its case is tightly gasketed, continuously purged, completely weatherproof, highly resistant to dust, fumes, and vibration. There's nothing to align, nothing to wear out. A flexure-strip fulcrum eliminates the friction and wear of conventional pivots . . . eliminates "conventional" maintenance.

In operation, the M/59 fully utilizes the speed and sensitivity of the Foxboro d/p Cell Flow Transmitter . . . does away with transmission lag . . . gives fastest recovery from process upsets. For the *complete* story, write today for Bulletin 470.

"Live-Balance" Control on any fluid with any size valve motor.

Lowest first cost. Lowest installed cost.

Lowest maintenance cost.

Unique Simplicity — exclusive design permits fixed, optimum proportioning and reset values for liquid flows. Adjustable reset optional for gas or steam flow.

THE FOXBORO COMPANY, 607 NEPONSET AVENUE, FOXBORO, MASS., U.S.A.

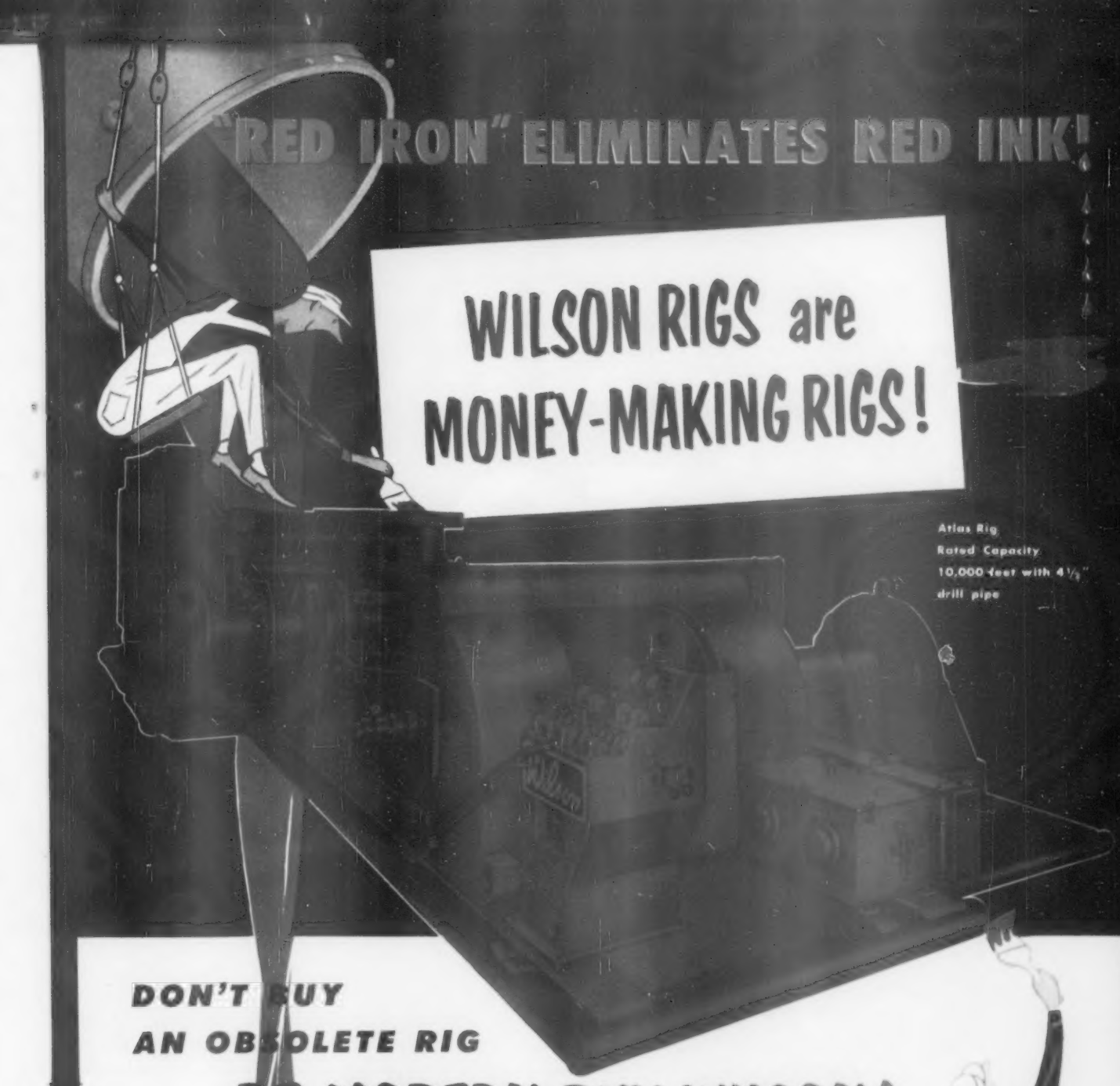
FOXBORO
REG. U.S. PAT. OFF.

FLUID FLOW CONTROLLERS

FACTORIES IN THE UNITED STATES, CANADA AND ENGLAND

"RED IRON" ELIMINATES RED INK!

WILSON RIGS are MONEY-MAKING RIGS!



Atlas Rig
Rated Capacity
10,000 feet with 4½"
drill pipe

DON'T BUY AN OBSOLETE RIG

BE MODERN-BUY WILSON!

First choice with Drilling Contractors . . . Best Friend of the Auditors. Wilson — the FIRST NAME in DRILLING RIGS! The only compound rigs with EIGHT SPEED, ALL-FRICTION DRIVES. Wilson . . . the Power Rig Pioneer . . . is still years ahead of the field.

The FIRST NAME in DRILLING RIGS!

WILSON MANUFACTURING CO., Inc.

The HOME of RED Iron • WICHITA FALLS, TEXAS, U.S.A.

AIR
TO
SPARE

...that's the secret of

CLARK TURBO-*SUPER*CHARGING

Obviously, any turbocharged 2-cycle engine must be supercharged. The extent to which it is supercharged is dependent on the volume of air and the pressure level maintained.

There's air to spare in Clark Turbocharged Compressors, even though a supercharging pressure of 6 psig is maintained at rated load and increased to 10 psig at maximum load.

Elevated pressures alone are not enough. While high pressure is desirable to increase power output, it must be accompanied by a sufficient volume of air: (1) To insure thorough scavenging with a cool, pure air charge for efficient combustion; (2) To thoroughly cool the power cylinder walls for proper lubrication of pistons, rings and cylinder walls.

Conversely, lower pressure supercharging reduces potential power output or results in "highly optimistic" ratings.

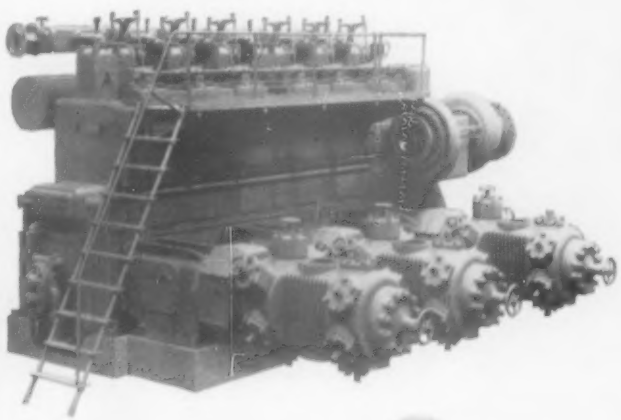
The only practical way to turbo-supercharge, therefore, is to provide a substantial volume of air at elevated pressures and to maintain the volume in proportion to the load placed on the engine. *That's precisely what Clark Turbo-Supercharging does!* The unusually high efficiency of the Clark Turbocharger permits pumping air at sufficient pressure and volume so that power output per cylinder can be increased from 33 to 65% over comparable non-turbocharged units, while cylinder wall temperatures are actually reduced.

Economical to install and operate, Clark Turbocharged Compressors are built in 8 sizes covering an 1100 to 3300 BHP range. Your nearest Clark representative has complete details. Write for Bulletin 134.

CLARK BROS. CO. • OLEAN, N. Y.
ONE OF THE DRESSER INDUSTRIES
Sales offices in Principal Cities throughout the World

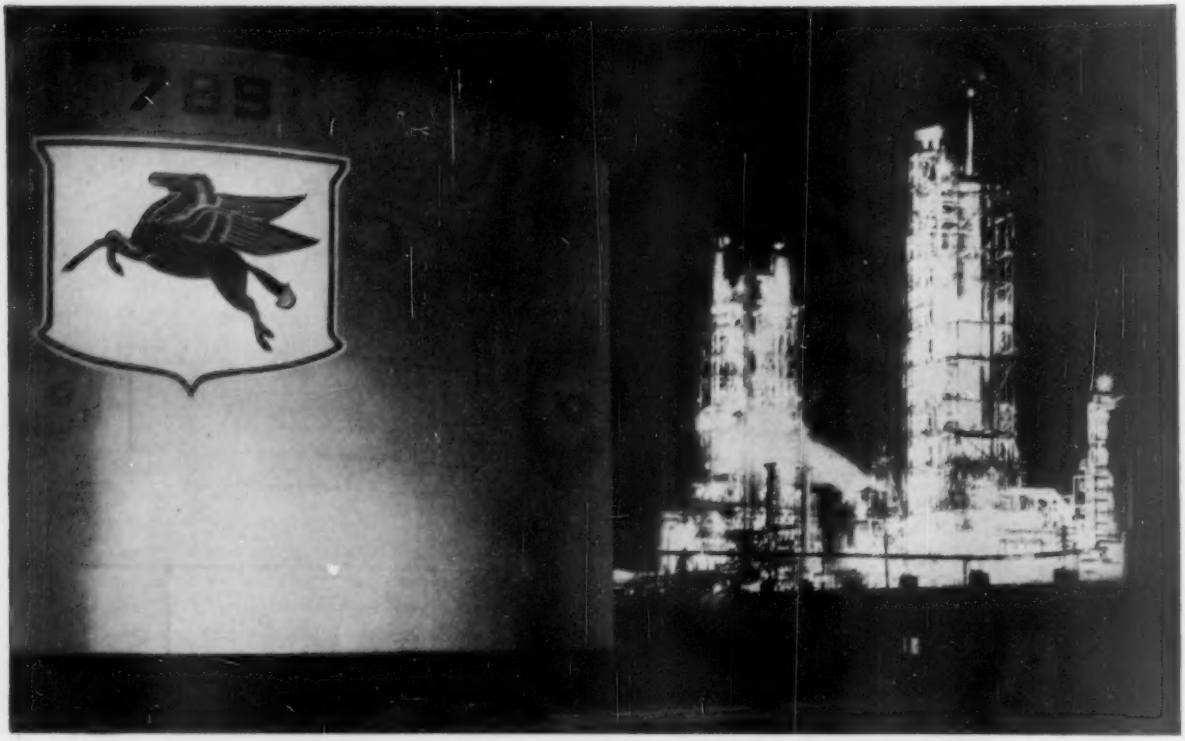
CLARK

COMPRESSORS



Clark sets the pace in compressor progress

75 1880—1955 YEARS



Raymond COMPLETES

ANOTHER CONTRACT FOR MAGNOLIA

ONE OF THE NICEST TRIBUTES any company can receive is the return of a satisfied customer. Three times Magnolia Petroleum has turned to Raymond with their foundation problems. At their Beaumont, Texas Refinery (part of which is shown above), four structures rest on over 32,000 feet of Raymond Standard Piles. Naturally, we're proud of these repeat performances. But we also enjoy welcoming new clients to the list of those we have worked with for a good many years. May we be of service to you?

RAYMOND'S DOMESTIC ACTIVITIES
Foundations . . . Marine structures and Off-shore Construction . . . Heavy Construction . . . Soil Investigations.

RAYMOND'S ACTIVITIES ABROAD
Complete service for all types of construction.

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BRANCH OFFICES
in principal cities of the United States, Canada, Central and South America.

140 CEDAR STREET • NEW YORK 6, N. Y.

FOR HEAVY MUD PUMP LOADS

BRONZE BEARINGS

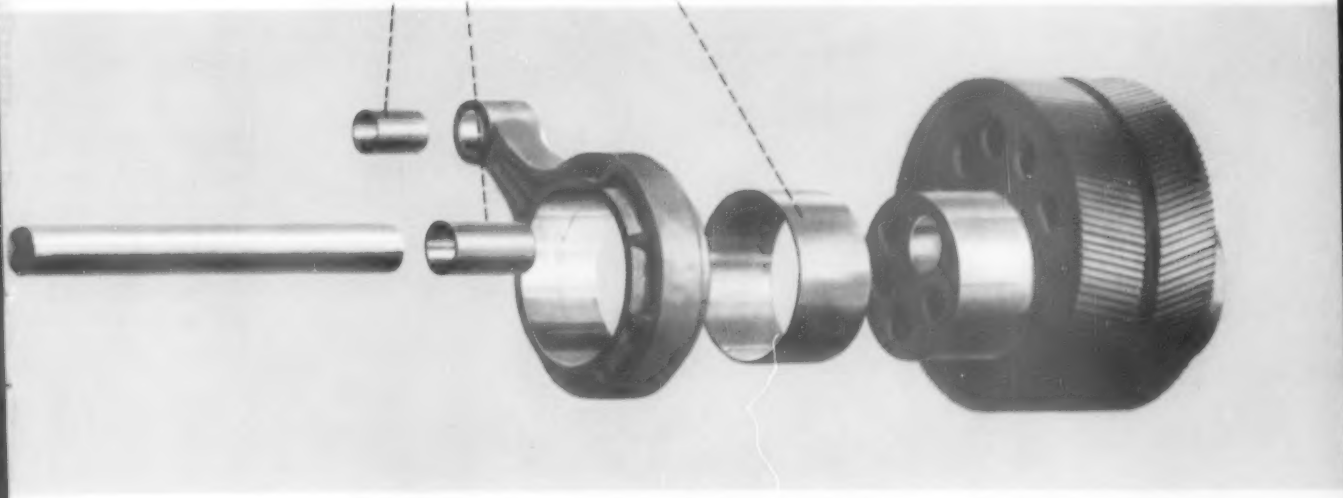
ARE BEST!

an exclusive feature of

GARDNER-DENVER

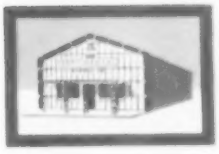
Power Mud Pumps

In Gardner-Denver Mud Pumps the eccentric bushings, connecting rod liners and crosshead pin bushings . . . all sleeve-type bronze bearings . . . are best for handling reciprocating loads. Unit bearing loads are reduced and all shock loads are cushioned.



CONTINENTAL

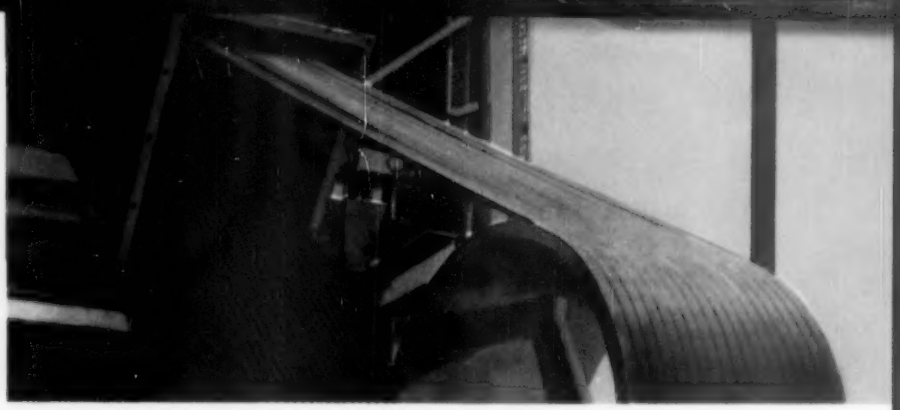
Serving the Oil and Gas Industries



THE CONTINENTAL SUPPLY COMPANY

General Offices: DALLAS, TEXAS

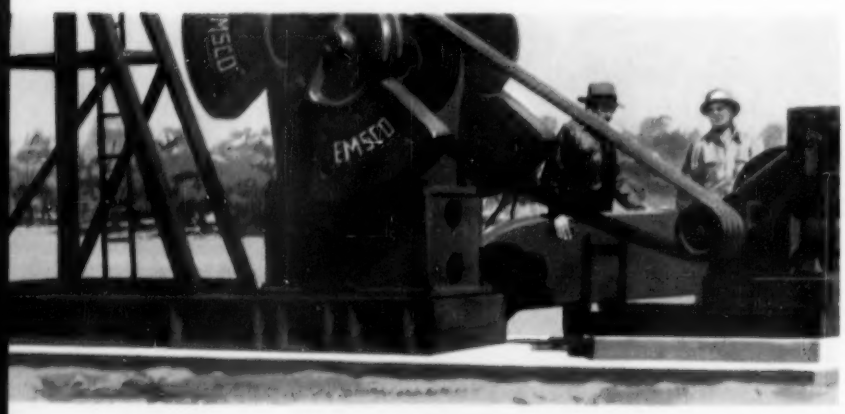
Representatives in All Principal Oil Fields of the World

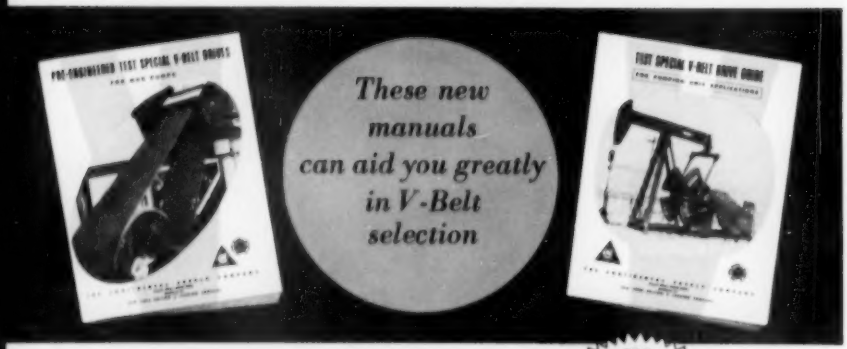


TEST SPECIAL V-BELTS

The only V-Belt engineered, manufactured, marketed; exclusively

FOR OILFIELD USE!





Manufactured exclusively for rugged oil field use, Test Special V-Belts are products of the New York Belting & Packing Company, America's most experienced makers of industrial rubber goods.

Test Special V-Belts can now be applied on the basis of new V-Belt engineering standards established for the oil fields.

Test Special V-Belts are carried in stock, in matched sets, by your Continental Store.

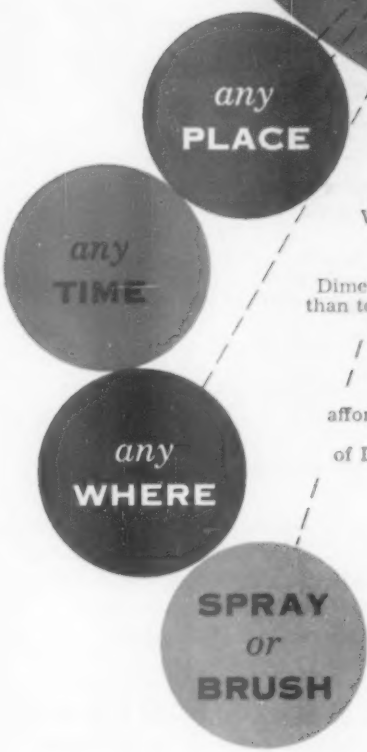
THE CONTINENTAL SUPPLY COMPANY
General Offices: DALLAS, TEXAS
Representatives in All Principal Oil Fields of the World

NEW YORK BELTING & PACKING CO. • Founded 1846

CONTINENTAL
Serving the Oil and Gas Industries

Now...your own painter can "COLD-GALVANIZE" any steel surface with DIMETCOTE

* the 100% inorganic zinc coating



Dimetcote is absolutely unique. It is not a paint, it contains no oils, resins or any other organic materials, yet it can be applied by spray or brush. When Dimetcote is applied to steel, a reaction takes place at the surface which produces chemical bonding as well as physical adhesion. It is almost impossible to find the interface between Dimetcote and the steel.

Dimetcote has many unusual characteristics. It shows no visible change after more than ten years exposure to the most severe weather conditions – sun, heat, fresh and salt water. It is insoluble in all solvents and petroleum products. It is highly abrasion resistant, but if abraded through to bare steel, the coating will cathodically inhibit corrosion.

Now tanks and structures can be given the same protection that galvanizing affords, *plus salt water resistance*. Existing structures need not be dismantled and new structures can be coated either before or after erection. *Only one coat* of Dimetcote over a sandblasted surface is required to protect such structures as:

Tank Exteriors • Cargo Tanks in Tankers • Dam Gates • Structural Steel • Christmas Trees • Buoys • Floating Roof Tanks • Offshore Rigs • Water Tanks • Barges • Ship Decks • Stacks

Write for the Dimetcote Technical Bulletin today.

Follow the line of MOST resistance:

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4809 Firestone Blvd.,
South Gate, California

Evanston, Ill. • Kenilworth, N. J. • Jacksonville, Fla. • Houston, Tex.

Make All Your Low Pressure Hose Lines from This *NEW* Aeroquip Kit

SPEED REPLACEMENT! CUT COSTS! REDUCE INVENTORY!

DURABLE ALL-STEEL BOX

JUST PUSH Aeroquip 1525 Hose on the **SOCKETLESS** Fitting . . . It Stays On Even at Pressures as High as 250 p.s.i.
PATENT APPLIED FOR

Back of fitting tray can be raised for convenient use

Kit 5144 contains 93 fittings and adapters in 20 sizes and types

Compartment of Kit 5144 contains 24 ft. of ¼" hose, and 24 ft. of ⅜" hose

Pull out hose, measure it, and cut with knife

Many users have requested a permanent-type container for Aeroquip *SOCKETLESS* fittings and hose. So this durable all-steel Kit 5144 is now available. It contains an inventory of hose, fittings, and adapters in types and sizes that will meet practically all low pressure applications.

With remarkable new Aeroquip *SOCKETLESS* fittings and hose, fuel, oil, water, and air lines can be made and installed *extra fast* on all kinds of industrial and mobile equipment. Field replacement is simplified because Kit 5144 is compact (12½" x 12½" x 6½" when closed) and it will stand up in field service.

Aeroquip *SOCKETLESS* fittings and hose are saving time and money for users in every industry. Get the complete story from your Aeroquip distributor, listed in your Yellow Page Directory, or write us.

Also Available: 15-Cell Kit No. 5143 with 24 feet of ¼" hose and 71 fittings and adapters in same box.

Aeroquip
REG. TRADEMARK

AEROQUIP CORPORATION, JACKSON, MICHIGAN

LOCAL REPRESENTATIVES IN PRINCIPAL CITIES IN U.S.A. AND ABROAD • AEROQUIP PRODUCTS ARE FULLY PROTECTED BY PATENTS IN U.S.A. AND ABROAD

"First Aid"

for ailing wells...

ATPET® 931

When wells get "sick," use this field-proved chemical stimulation treatment—

FOR BREAKING WATER BLOCKS

ATPET 931 is a quick-payout way to revive dead wells or stimulate low producers.

TO IMPROVE FRACTURING JOBS

ATPET 931 helps eliminate water that can impair flow and reduce fracturing results.

AFTER ACIDIZING JOBS

ATPET 931 helps clean out spent acid which could cause "water-block" and reduce effectiveness of the treatment.

FOR COMPLETING NEW WELLS

ATPET 931 prevents potential flow-limiting blocks caused by water based drilling muds or cementing.

Ask your service company about ATPET 931. It costs remarkably little to use, and it pays off in real improvements in production. Insist on ATPET 931, the field-proved material for water-block removal. Write to Atlas today for complete technical information.

CHEMICALS DIVISION

ATLAS POWDER COMPANY

WILMINGTON 99, DELAWARE

ATLAS POWDER COMPANY, CANADA, LTD.
BRANTFORD, CANADA

Specified for More Jobs than any other small forged steel gate valve

CHAPMAN List 960

Chapman List 960 is specified for more different applications than any other small forged steel gate valve in the world. Engineers know that List 960 valves keep maintenance expenses low under the most severe service conditions.

Seizing and galling are virtually eliminated, because wedge gate faces are superhardened to 800 Brinell. Stainless steel seat rings, hardened to minimize wear, are easy to replace, make it unnecessary to lap-in gate and seats. Stem guide passages are carefully machined to minimize stresses, keep operation smooth and trouble-free over long periods. Stem-and-gate connection is extra strong where extreme stresses can develop.

For every application you have for small forged steel gate valves, specify Chapman List 960. Sizes from ¼" to 2". Rising stem with yoke (shown) or rising stem with inside screw. Metal-to-metal or gasketed bonnet joint, depending on application. Pressure range to 2000 pounds at 100°F, to 380 pounds at 1000°F. For higher pressures, specify List 990. Write for your copy of Catalog 10 now.

The Chapman Valve Manufacturing Co.
INDIAN ORCHARD, MASSACHUSETTS

Your **KEY** *to* Quick Service

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84 YEARS OF PROGRESS WITH THE OIL INDUSTRY

Allis-Chalmers presents the new

HD-11

ANOTHER BIG STEP AHEAD IN LOW-COST DIRT MOVING

90 net engine hp
75 drawbar hp
20,500 lb

. . . with all the important performance advantages of Allis-Chalmers advanced basic design . . . tested and proved over millions of operating hours!

All-Steel Box-A Main Frame that soaks up shock loads, makes possible the service simplicity of unit construction.

Exclusive One-Piece Steering Clutch and Final Drive Housing with all final drive gears straddle-mounted on tapered roller bearings to insure long life.

Unit Construction lets you remove engine, master clutch, transmission, steering clutches and final drives without disturbing adjacent parts.

1,000-Hour Lubrication Intervals for roller bearing truck wheels, idlers and support rollers . . . makes production time out of service time.

Dual-Range Constant-Mesh Transmission lets you go from any forward speed to any reverse speed by shifting only one lever. Eliminates double shifting! That means faster work cycles . . . more production!

NEW STANDARDS OF PERFORMANCE AND LONG LIFE ON A WIDE RANGE OF JOBS

You owe it to yourself to investigate the performance advantages of the HD-11 . . . newest addition to the Allis-Chalmers leadership line. See your nearby Allis-Chalmers dealer now.

New Allis-Chalmers Diesel Engine with "follow-through" combustion and tornado turbulence . . . for smooth engine performance, cleaner combustion, extra long engine life.

New Wrap-Around Radiator Guard used as dozer lift frame to simplify design, reduce cost of bulldozer; guard tilts forward for easy service.

New Master Clutch with Ceramic Lining sets new standards of clutch life . . . with fewer adjustments required.

New Operator Convenience including roomy, flat platform . . . foam rubber seat . . . 24-volt direct electric starting . . . 60-gal. fuel tank

Tough New Track — New design, through-hardened with extra toughness for long life even in severe abrasive conditions.

PLUS . . . new, all-weather cooling; independent radiator-core mounting; new strength and capacity in final drive gears, shafts and bearings.

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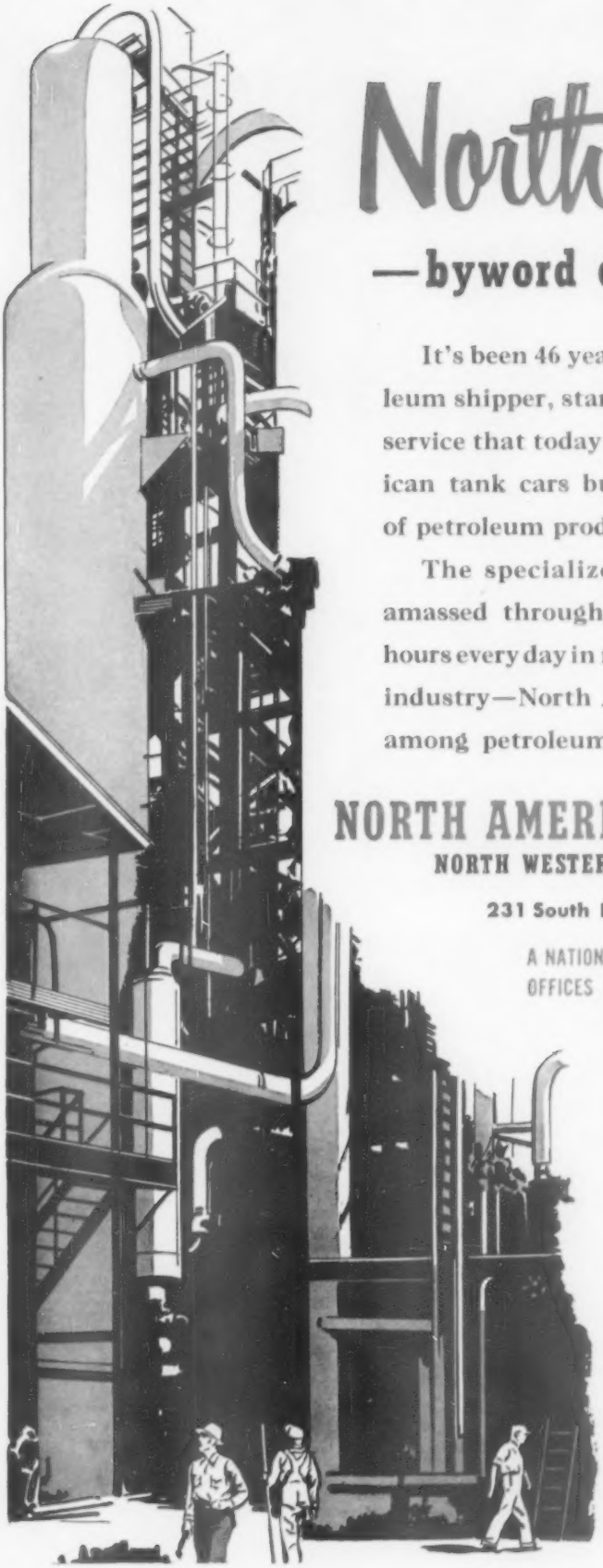
TRACTOR DIVISION — MILWAUKEE 1, U. S. A.



North American

—byword of petroleum shippers

It's been 46 years since we served our first petroleum shipper, starting a specialized transportation service that today keeps a great fleet of North American tank cars busy exclusively in the movement of petroleum products.

The specialized petroleum traffic knowledge amassed through those years now does a job 24 hours every day in maintaining top level service to the industry—North American service that's a byword among petroleum shippers. Take advantage of it.

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TORRINGTON HEAVY DUTY NEEDLE BEARINGS *are used in a wide variety of machinery, including cranes, oil field equipment, hydraulic pumps, air compressors and machine tools.*

TORRINGTON Heavy Duty Needle Bearings

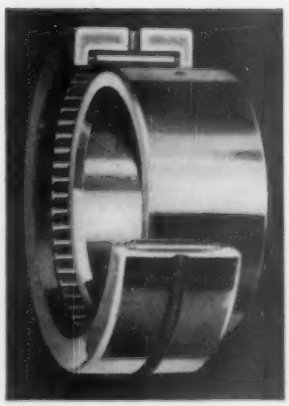
are designed and manufactured to give added strength—for long economical service

Even a casual look at the TORRINGTON HEAVY DUTY NEEDLE BEARING suggests strength—the one-piece channel construction, the sturdy roller ends and integral side flanges.

Carburizing-grade nickel steel is used for both inner and outer race, giving a harder, more wear-resistant surface, and a tougher, shock-absorbing core.

Accurately ground raceway and side flanges eliminate drag at roller contact and keep rollers in a true path.

These are some of the reasons why TORRINGTON HEAVY DUTY NEEDLE BEARINGS have earned the confidence of leading machinery builders and users in many industries. Specify these rugged TORRINGTON bearings and get top performance, low maintenance service in your equipment. They are available from stock in a complete range of sizes.



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THE PROOF IS IN THE FIELD . . .

Carter

Long-stroke Hydraulic Pumping Units

Featuring the amazing Variable-Cycle Principle

Designed — Built — Priced FOR STRIPPER WELLS

CALIFORNIA

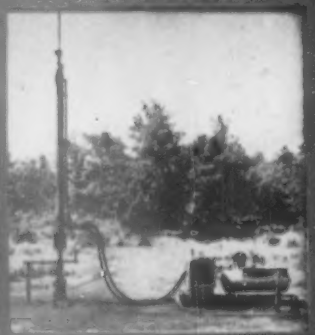
Carter Unit Pumping in Edna Field, has been in service for seven years.

KANSAS

One of 4 units in the Great Bend Area, pumping from 3400 ft., owned by large independent.

EAST TEXAS

One of 4 Carter Units owned by an major oil company in Kilgore and Turnertown Areas. Pumping allowable from 3300 ft. Total cost about 50% of the cost of a conventional unit.



OKLAHOMA

One of seven units owned by an independent in the Tulsa Area, pumping from about 1500 ft. Operator reports production holding up better than offsetting wells with conventional units.

KENTUCKY

Carter Unit on 15-ft. substructure in the Green River formations. Operator saved about 50% on substructure cost alone. This is one of seven units owned by this independent.

NORTH TEXAS

Major oil company installation in Caddo Field, pumping 30 bbl./day from 6250 ft. No rod failures in more than a year's operation. Total cost about 50% of the cost of a conventional unit.

CANADA

Carter Unit operating in 70 degree below-zero weather in the Carbondale Field, showing adaptability of Carter Unit to extreme climatic conditions.

SOUTH TEXAS

Production increased from 2½ bbl./day to 6 bbl./day on this 7700-ft. well in the Duval County Area, when it replaced conventional equipment. This is one of 11 units owned by this independent.

WEST TEXAS

Carter Unit in the Spraberry Area, pumping from 7085 ft. This well was installed for about 50% of the cost of a conventional unit.

MORE THAN 800 UNITS NOW IN SERVICE!

MORE THAN EIGHT YEARS OF FIELD EXPERIENCE!

From Canada to the Gulf, from Ohio to the Pacific, Carter Long-Stroke Hydraulic Pumping Units are saving thousands of dollars, for majors and independents alike, through lower first cost and maintenance as well as increasing production in many cases.

WRITE FOR BULLETIN PR-355

S. C. CARTER COMPANY, inc.

1900 Santa Fe Avenue • Los Angeles, California

Sales and Service Representatives in —

[illegible] INDIANA and [illegible] Supply Company, Robinson, Salem, Ill.; Princeton, Evansville, Ind.; Irvine, Oil Springs and Glenwood, Ky. KANSAS, OHIO, and WEST VIRGINIA—Buckeye Supply Company, Arkansas City, Cheney, El Dorado, Great Bend, Wichita, Kansas; Wooster, Zanesville, Ohio; Vienna, W. Va.; MICHIGAN—The Streeter Supply, Mt. Pleasant. OKLAHOMA—A. D. Lorton Supply Co., Oklahoma City, Ponca; G & G Machine and Equipment Co., Hobbs. ARKANSAS, LOUISIANA, NEW MEXICO and TEXAS—Wilson Supply Company, Harvey Hydro, Tyler Charles, New Iberia, Shreveport, La.; Alice, Barbers Hill, Bay City, Beaumont, Columbus, Corpus Christi, Houston, Kilgore, Liberty, Morehead, and Victoria, Texas; Bridge Supply Company, Borger, Pampa, Texas. ROCKY MOUNTAIN AREA—Sage Sportswear Co., Casper, Wyo.; Fowler Oilfield Management Co., Conrad, Montana.

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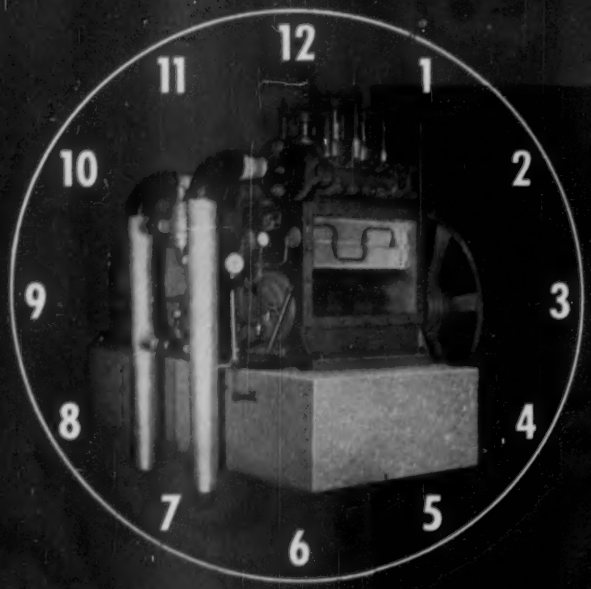
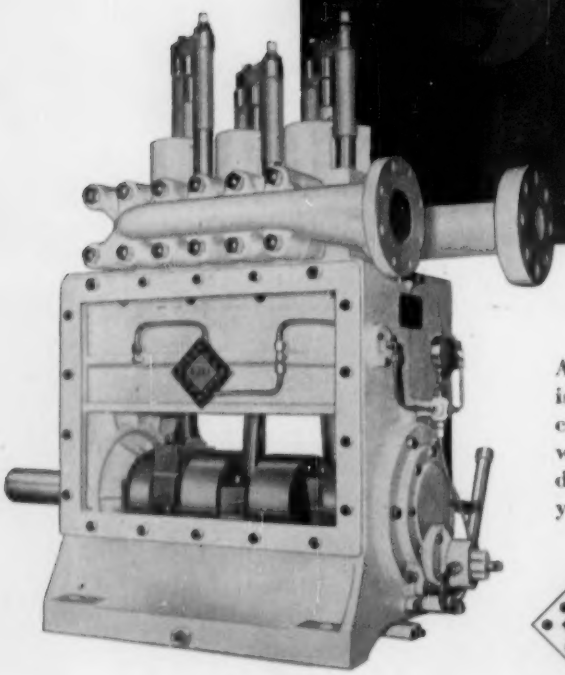


For CONSTANT PRESSURE

INSTALL AN

TP-4000 SERIES

PUMP



IN YOUR RECOVERY OPERATION

Ability to maintain pressure in water-flooding is vital to efficient oil recovery at minimum costs. You get this dependable performance with the Ajax TP-4000 Pump because it is designed and built with your needs as the yardstick—by the makers of Ajax Engines with a worldwide reputation for reliability. • Get the Ajax Pump facts—and you'll buy an Ajax Pump! *Write us for descriptive Bulletin 531 - - - see your Supply Man!*

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AJAX IRON WORKS

Builders of GAS AND OIL ENGINES, PRESSURE PUMPS, STEAM DRILLING ENGINES, INDUSTRIAL STEAM ENGINES

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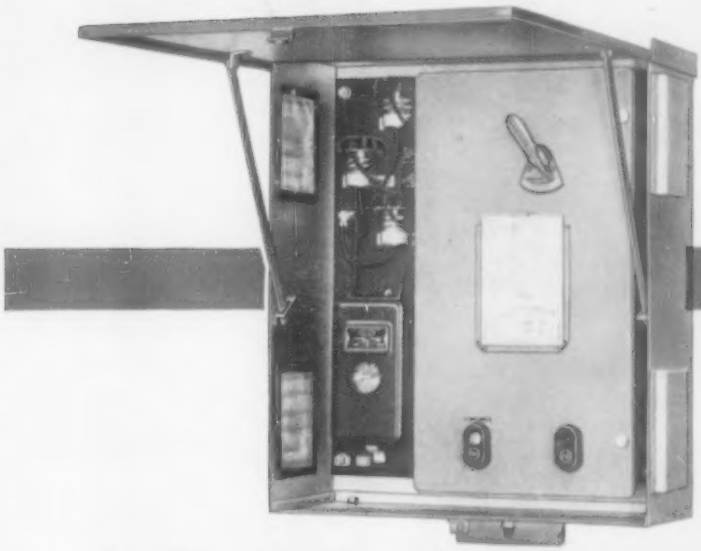
Improved C-H Oil Well Pumping Control permits easy in-the-field modification to the type of restarting desired after power interruptions.



Grim. Okla.

Oil City, Tex.

Baytown, Tex.

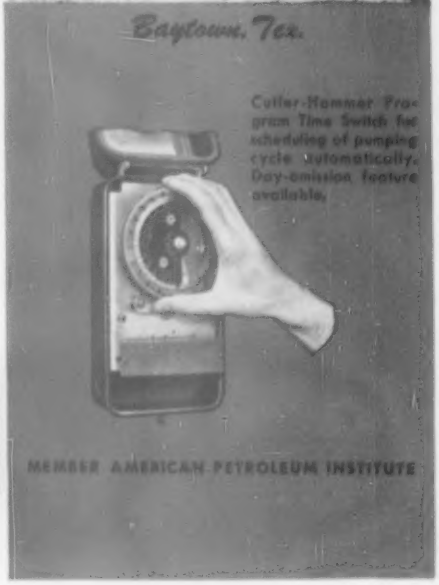
STOP BUYING NEW STARTERS EVERY TIME YOUR NEEDS CHANGE

Get C-H Oil Well Pumping Control that makes it easy to modify restarting characteristics

There is no need to buy replacement starters every time you extend your oil well pumping operations. Cutler-Hammer Oil Well Pumping Control contains provisions that make it a simple matter to change from immediate restarting after a power failure, to manual restarting, or to automatic time-delay staggered restarting. The control panel now readily accepts either a C-H Undervoltage Relay or a C-H Time Delay Relay. Panel space is provided and a diagram inside the cover shows all circuit arrangements with leads numbered to permit easy wiring changes.

Here's how it works. If you are operating just a few wells the basic C-H Pumping Control automatically restarts pump motors just as soon as power is restored. But if you increase the number of wells operating, the combined restarting load of all pumps may become too heavy. Then you add C-H Undervoltage Relay and pumps are restarted manually, one at a time. But if your operations become so extensive as to prohibit manual restarting, you simply change to C-H Time Delay Relay that provides automatic staggered restarting. No need to buy new starters as your needs change. Just the simple, inexpensive addition of one relay or another, in space provided for the change.

This feature is in addition to aluminized enclosure that reflects sun rays and heat; screened and louvered ventilators that shut out dirt and pests; cool, dust-safe vertical contacts; finest program timeswitch; full 3-phase overload protection; high torque clock motor; etc., etc., etc. The original oil country pumping control that has no equal. Insist on Cutler-Hammer and refuse all substitutes. CUTLER-HAMMER, Inc., 1453 St. Paul Avenue, Milwaukee 1, Wisconsin. *Associate:* Canadian Cutler-Hammer, Ltd., Toronto, Ontario.


Cutler-Hammer Program Time Switch for scheduling of pumping cycle automatically. Day-omission feature available.
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CUTLER·HAMMER
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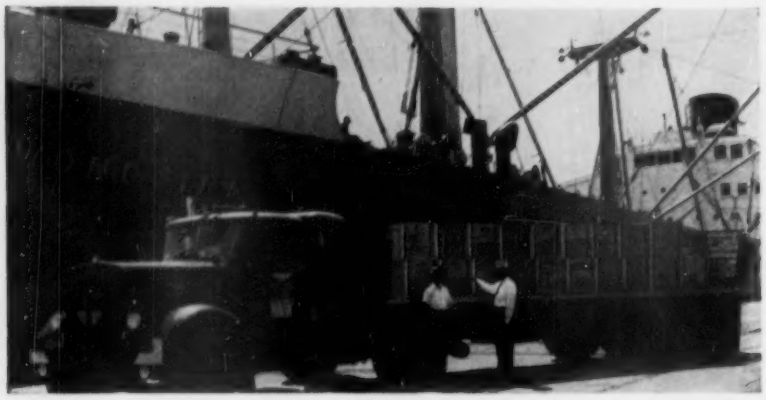
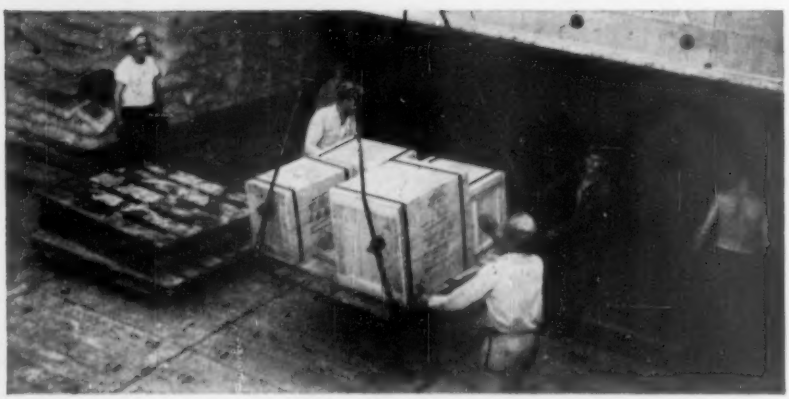
Nine month's supply of

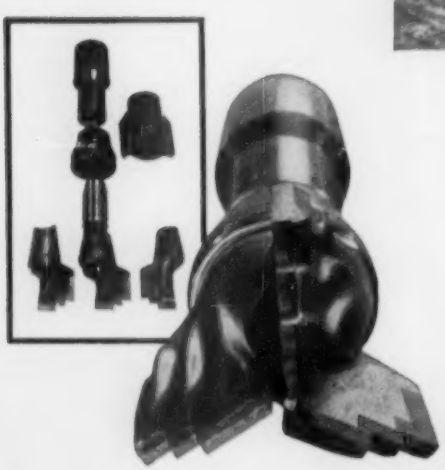
HAWTHORNE "BLUE DEMON" ROCK BITS...



...embark for the Persian Gulf

...IN TEN DAY'S TIME!





- *Fast delivery from ample stock.*
- *Meeting field requirements, in hard and soft formations, with economical and efficient performance.*
- *Satisfying purchasing economies.*

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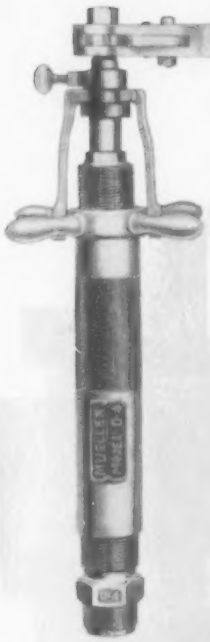
MUELLER



Safe Hot Taps!

Make connections to lines or tanks under pressure quickly, simply and in complete safety with the Mueller "D-4" or "E-4" Drilling Machines.

Companion No-Blo® Fittings are used to make temporary or permanent connections to any size line or tank with the "D-4" or "E-4" Machine. The Mueller No-Blo method allows all operations to be completed under pressure safely, quickly and with no loss of fluid.

"D-4" DRILLING MACHINE
Drills ¼" through 2⅝". Boring bar travel—14"

Working pressures to 500 p.s.i. at 100°F.
Working temperatures to 250°F. at 375 p.s.i.

"E-4" DRILLING MACHINE
Drills ¼" through 1½". Boring bar travel—9 9/16"

NO-BLO®

MUELLER CO. DECATUR, ILL.

Dependable since 1857

FACTORIES & OFFICES AT DECATUR · CHATTANOOGA · LOS ANGELES · SARNIA, ONTARIO

LET'S EXAMINE

SpringKore

ADVANTAGES

What does the spring center do for J&L SpringKore rotary drilling line?

FLEXIBILITY – SpringKore's spring center is flexible, and the wide distribution of internal pressures enables the wire rope to maintain its original flexibility for long periods despite heavy-duty hazards.

RESISTS CRUSHING ACTION – The high-carbon, cold-drawn steel spring center greatly resists crushing action, and it has the ability to "snap-back" if crushed, returning to its original shape and diameter more readily than any other wire rope.

COMPLETE LUBRICATION – The hollow inside center of the spring permits SpringKore to hold more lubricant than any wire rope previously manufactured. This reservoir keeps the innermost parts of the rope well lubricated, cutting down on both rust and friction wear.

J&L STEEL

Your near-by J&L store can pinpoint other advantages—can give you interesting evidence of a local nature that SpringKore rotary drilling lines are sound, practical and economical.

Jones & Laughlin
STEEL CORPORATION
SUPPLY DIVISION – TULSA, OKLAHOMA
Serving The United States and Canada

123-5

Rogers Crews

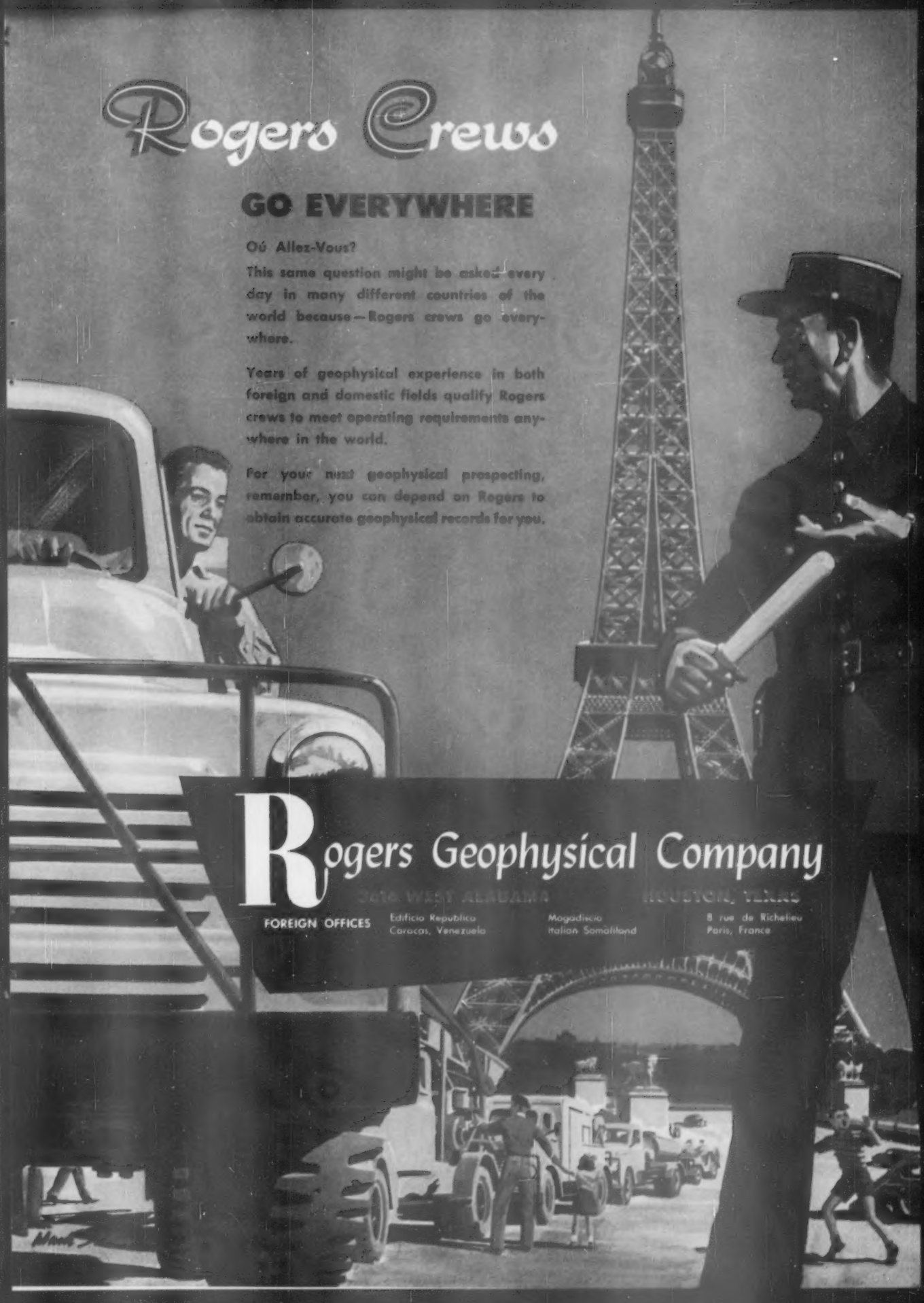
GO EVERYWHERE

Où Allez-Vous?

This same question might be asked every day in many different countries of the world because—Rogers crews go everywhere.

Years of geophysical experience in both foreign and domestic fields qualify Rogers crews to meet operating requirements anywhere in the world.

For your next geophysical prospecting, remember, you can depend on Rogers to obtain accurate geophysical records for you.



Rogers Geophysical Company

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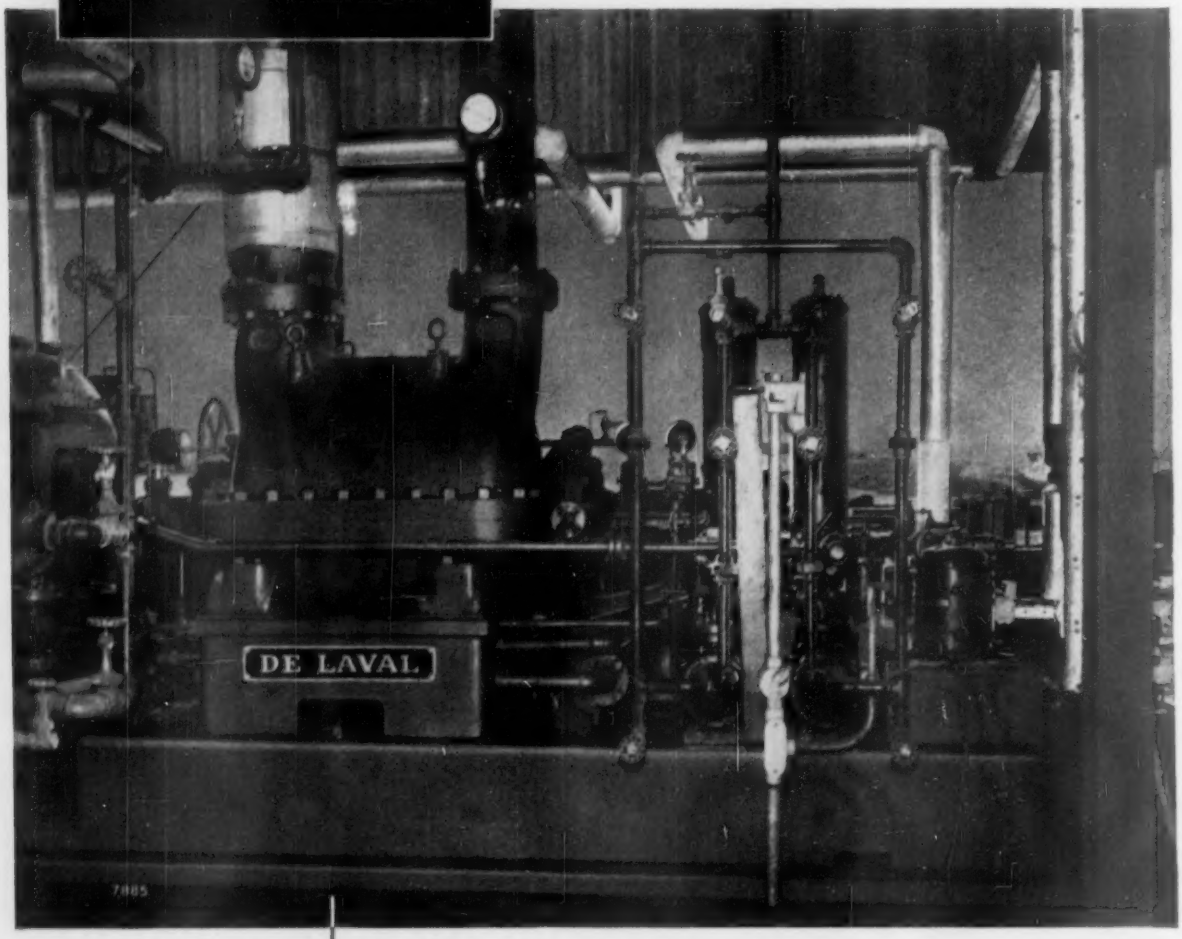
DE LAVAL
CENTRIFUGAL COMPRESSOR

handles propane-butane for M. W. Kellogg alkylation unit



New Bulletin 0504 gives complete data

On stream at a plant of a large mid-western refiner, this De Laval unit compresses the propane-butane mixture to prepare it for an M. W. Kellogg alkylation unit.

Inlet volume of the De Laval centrifugal compressor is 3,040 cubic feet per minute. Inlet pressure is 18 psia, and discharge pressure 85 psia. This compressor is equipped with De Laval contact-type oil seals. The unit is driven by a 600 bhp turbine running at 7,400 rpm.

De Laval compressors are designed and built for heavy duty continuous operation. Rugged, horizontally split casings, individually designed impellers, perfectly balanced rotors and externally mounted, cylindrically seated bearings assure optimum performance and long service.

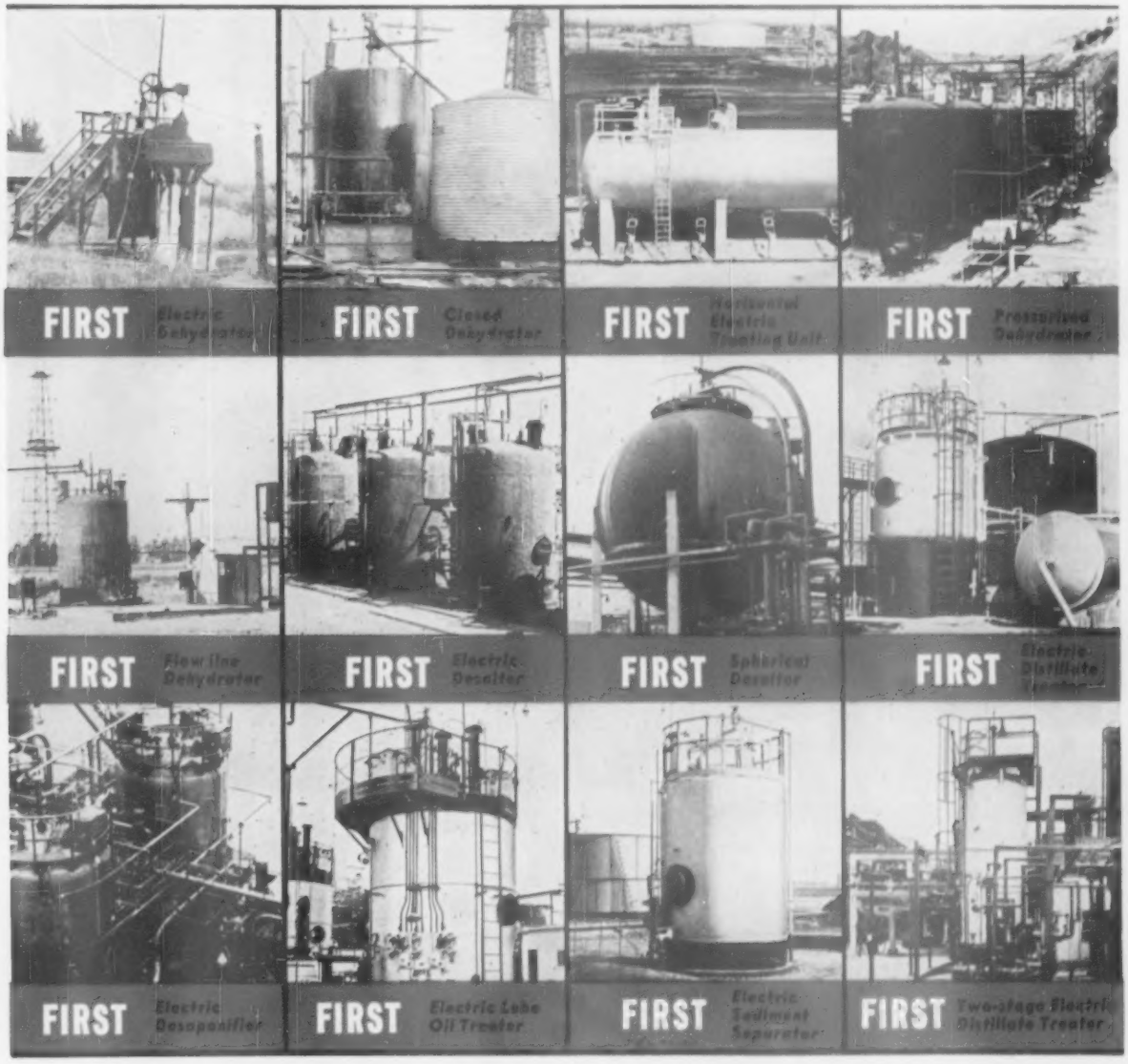
DE LAVAL *Centrifugal Compressors*

DE LAVAL STEAM TURBINE COMPANY
810 Nottingham Way, Trenton 2, New Jersey

DL 500

LEADERSHIP

Petreco leadership in electric processing is based on a long series of "firsts"



This foundation of progressive pioneering has enabled Petreco to help various branches of the industry increase both efficiency and profits. When emulsification threatened to cause the waste of millions of barrels of "cut" oil, Petreco brought out the first electric dehydrator. When salt was first recognized as an enemy in refining, Petreco developed the first electric desalter. When sediment in certain crude oils shortened the life of sub-surface pumping equipment, Petreco developed the electric sediment separator. As refinery processing became more precise, Petreco provided electric distillate treating to insure precision-controlled contacting, scrubbing and washing.

There is one basic and important reason why Petreco has been able to carry on this continuing program of pioneering development — the users of Petreco processing have profited substantially from this use.

For complete information on any of the Petreco electric processes, write or call

PETRECO

A DIVISION OF
PETROLITE CORPORATION

3202 South Wayside Drive, Houston 1, Texas
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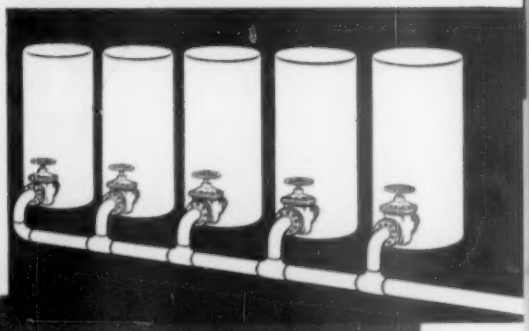
PETRECO®

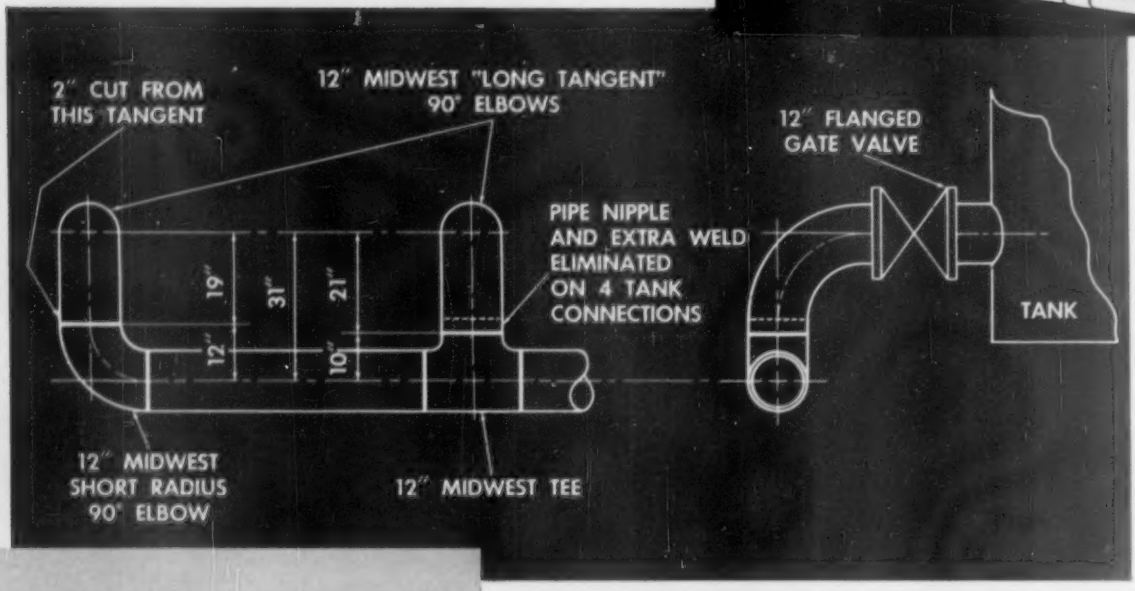
AP-8

MIDWEST "LONG TANGENT" ELBOWS

SAVED $156.20

On This Welding Piping





MIDWEST "LONG TANGENT" ELBOWS COST NO MORE THAN OTHER ELBOWS

The Problem:

To connect the five tanks shown in the sketch at top to a common 12" header.

The Difficulty:

The center-to-outlet dimension of the 4—12" tees is only 10", while the shortest elbow available measures 12" center-to-end. Thus, if standard long radius elbows are used next to the five tank valves, four short nipples and four extra 12" welds would be required.

The Solution:

By using Midwest "Long Tangent" elbows as shown in the blueprint, the expense of the four extra nipples and welds was eliminated at the cost of just one cut! The actual net savings made by "Long Tangent" elbows on this job was $156.20.

Remember—Midwest "Long Tangent" elbows cost no more than regular elbows! For further information, write for Catalog 54.

MIDWEST PIPING COMPANY, INC.

Main Office, 1450 South Second St., St. Louis 4, Missouri

PLANTS: ST. LOUIS, PASSAIC, LOS ANGELES, and BOSTON

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6820

MIDWEST WELDING FITTINGS IMPROVE PIPING DESIGN AND REDUCE COSTS

BAROID gives you all 9 factors for an accurate log of your well

Baroid mud-and-cuttings analysis provides a fast, accurate log of your well while the bit is making hole. You obtain well information simultaneously with the drilling operation. This continuing analysis assures you that every important trace of oil or gas will be detected, every possible pay zone discovered. Coring time can thus be reduced since only cores that count are taken at depths that the Baroid analysis shows oil and gas. Important on-location core analyses are made as part of your Baroid Well Logging Service.

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Depend on Baroid for an accurate log of your next well. Mail coupon today for latest Well Logging Brochure.

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Baroid

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PRITCHARD'S RIGHT FOR OFF-SITE!

Pritchard is a right and natural choice for design, engineering and construction of off-site facilities. Here's why . . .

Right experience. That means *complete* experience with large, complex jobs involving many diverse processes, necessitating diverse skills.

Right attitude. You'll find that Pritchard trained, experienced personnel have the right attitude toward your job. They work *with* your staff. Assurance to you that the job will be done right, right on time.

Right contract. The increasingly popular Pritchard Single Responsibility Contract frees you of detailed worry, saves you time, effort and money.

Planning off-site facilities? Pritchard's *right*. Consult Pritchard first!

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SERVING THE GAS, POWER, PETROLEUM AND CHEMICAL INDUSTRIES

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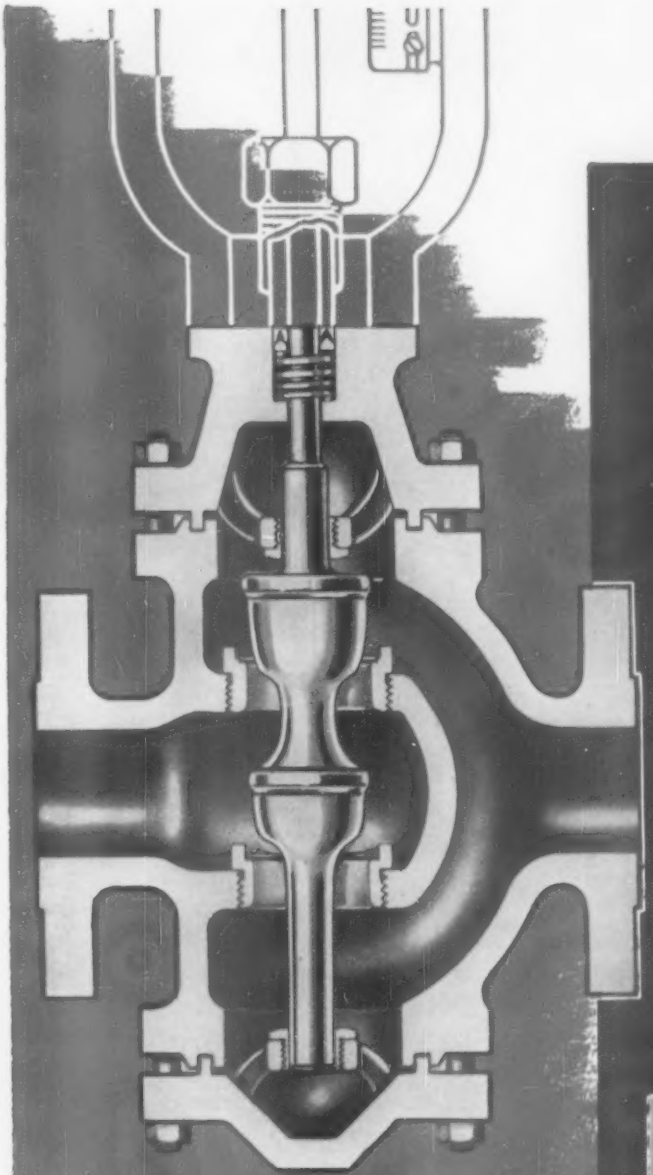
J.F. Pritchard & Co.

ENGINEERS • CONSTRUCTORS

Dept 453, 4625 Roanoke Parkway, Kansas City 12, Mo.



Insures superior control with tighter shut-off on high temperature service. Both upper and lower seating surfaces contact simultaneously at specified operating temperatures.

FISHER®

IS THE VALVE MANUFACTURER THAT LAPS THE SEATS OF DOUBLE PORTED VALVE BODIES AT OPERATING TEMPERATURES

Fisher valve being steam heated to specified operating temperature.

Inner valve being "ground in" while assembly is hot.

FISHER GOVERNOR COMPANY · MARSHALLTOWN, IOWA

WORLD LEADER IN RESEARCH FOR BETTER PRESSURE AND LIQUID LEVEL CONTROL

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CONTINENTAL MOTORS · Powerful as the Nation · AMERICA'S STANDARD ®

Continental Red Seal Power

. . . on the job year after year . . .

The downright dependability of Continental Red Seal engines is one of the big reasons why you find so many Continental-powered units on location in all phases of oil field service. Operators have found that these truly specialized power plants deliver their full work quota year after year—many under the least favorable working conditions—at lower cost and with a minimum of down time. In production, in distribution, and in processing, Red Seals deliver extra satisfaction for the simple reason that they are engineered and built with the needs of specific applications in mind. The Red Seal industrial engine power range is a broad one, with models at closely-spaced levels—14 to 240 horsepower—and they're available for operation on all standard fuels. Each is the product of more than 50 years' engine-building experience—each with the in-built stamina to "stand up and take it" on the job year after year.

4-CYCLE AIR-COOLED MODELS

AU SERIES

In addition to its large engines, Continental builds an outstanding line of heavy-duty air-cooled four-cycle models for industrial applications requiring 2 to 3 h.p. Advanced engineering gives them easy starting, high dependability, and unusual lugging capacity at low speeds . . . Options: patented and exclusive Contax® external ignition system, low-level ignition cut-off, 6-1 reduction gear, and other features. Available also for use on kerosene . . . For information on these models, address Air-Cooled Industrial Engine Division, 12800 Kercheval Ave., Detroit 15, Mich.

SERVICE FACILITIES AND GENUINE RED SEAL PARTS AVAILABLE EVERYWHERE

Continental Motors Corporation

MUSKEGON • MICHIGAN

6 EAST 45TH STREET, NEW YORK 17, NEW YORK • 6218 CEDAR SPRINGS ROAD, DALLAS 9, TEXAS • 3817 SOUTH SANTA FE AVENUE, LOS ANGELES 58, CALIFORNIA • 910 SOUTH BOSTON STREET, ROOM 1008, TULSA, OKLAHOMA • 1252 OAKLEIGH DRIVE, EAST POINT (ATLANTA) GEORGIA

Butyrate pipe cuts installation time

Tenite Butyrate's light weight and easy joining by solvent welding can cut labor installation costs by more than 60%.

Butyrate pipe cuts corrosion failures

Tenite Butyrate resists corrosion by sour crudes, brine and electrolytic soils. This Tenite section from a salt water disposal line is still in good condition after 2 years' service. On the same line, metal pipe used to fail completely in 6 months.

Butyrate pipe cuts paraffin clogging

How much time do you lose in cleaning out paraffin-clogged metal lines? The clean, smooth inner wall of a Tenite pipe offers no toe-holds for paraffin.

Could Tenite Butyrate cut costs for you?

SAVINGS BEGIN the minute you order Tenite Butyrate pipe. Its light weight saves freight, handling and distribution costs. Simple solvent welding with slip-sleeve couplings makes it fast to install. You have no expensive corrosion failure replacements, no periodic cleaning out of accumulated paraffin.

This lightweight pipe is only 1/12th the weight of cement-lined metal pipe. It has good impact resistance and performs well over a wide temperature range.

The petroleum industry has long sought a lightweight, corrosion-resisting pipe that would be strong enough to take the abuse of oil field use. Tenite Butyrate gives you this combination. Years of successful service in all types of fields prove its complete suitability for crude, corrosive water and brine lines. Mail the coupon for more information plus a list of Tenite pipe suppliers. EASTMAN CHEMICAL PRODUCTS, INC., Kingsport, Tennessee, subsidiary of Eastman Kodak Company.

TENITE
BUTYRATE
an Eastman plastic

EASTMAN CHEMICAL PRODUCTS, INC.
KINGSPORT, TENNESSEE

Please send me information on TENITE BUTYRATE PIPE and a list of companies manufacturing Tenite pipe and fittings.

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POSITION .....
COMPANY .....
STREET .....
CITY ..... STATE .....
OG7-55

CHARTING A COURSE FOR THE FUTURE

Like the rugged seafarers of an earlier century, modern industrial organizations are continually faced with the problems of charting a course which will ensure their future success.

And when the designated route requires the expansion or modernization of their processing facilities, these organizations must be certain that the construction firm selected for the job will be one with an outstanding record of past achievements.

Throughout the world, Procon has shown its ability to handle any process construction work efficiently and economically. With such a record, Procon has enabled its many clients to enjoy the benefits of rapid on-stream operations.

Discuss your next process construction job with a Procon engineer. You'll find him ready to assist you in planning your course for the future.

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PROCON (CANADA) LIMITED—40 ADVANCE ROAD, TORONTO
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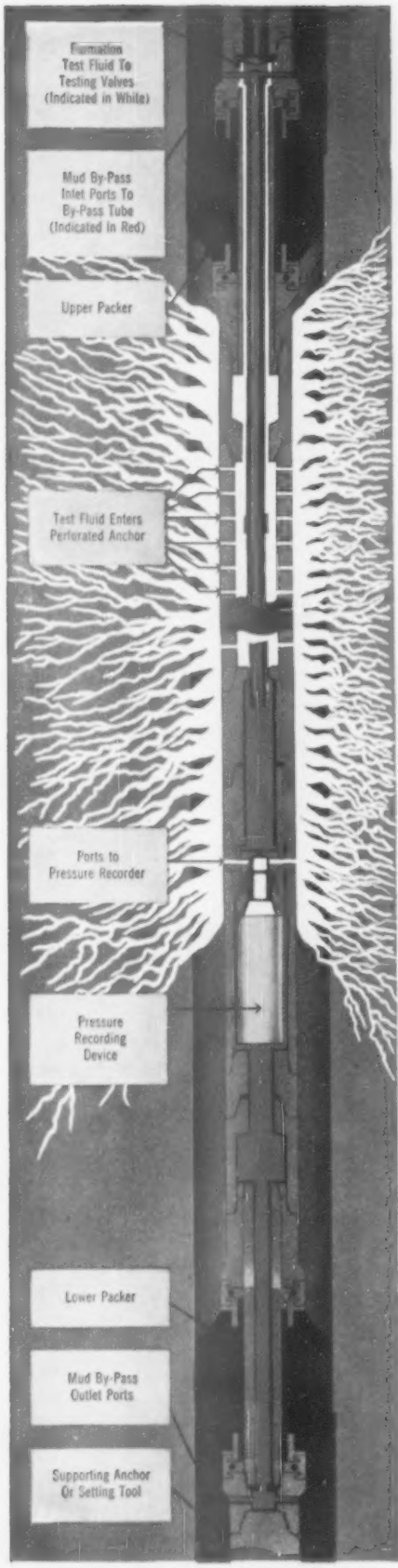
WORLD-WIDE CONSTRUCTION FOR THE PETROLEUM, PETROCHEMICAL, AND CHEMICAL INDUSTRIES

PROCON®


Formation Test Fluid To Testing Valves (Indicated in White)
Mud By-Pass Inlet Ports To By-Pass Tube (Indicated in Red)
Upper Packer
Test Fluid Enters Perforated Anchor
Ports to Pressure Recorder
Pressure Recording Device
Lower Packer
Mud By-Pass Outlet Ports
Supporting Anchor Or Setting Tool

Straddle Testing

in open hole another Johnston first*

Now, with complete confidence, you can...

- EVALUATE UP-THE-HOLE ZONES
- LOCATE GAS, OIL, AND WATER CONTACT
- HELP PROTECT HOLE AND SUPPORTING ANCHOR

See how Johnston Straddle Testing with STRADDLE MUD BY-PASS maintains full hydrostatic mud pressure on upper and lower packers—and on all formations below lower packer. Lessens the load on supporting anchor and prevents production from any lower zone in the event of lower packer failure. Should either packer fail, you get an immediate surface indication. Get all these advantages plus ease of running tool into and out of the hole.

*Johnston Straddle Testing with Straddle Mud By-Pass is covered by patent and patents pending. Another Johnston first!

for descriptive folder write to:

JOHNSTON TESTERS

first in drill stem testing

P. O. Box 98,
HOUSTON, TEXAS

LOS ANGELES, CALIF. • CALGARY, CAN.

FORMATION AND CASING TESTING — JOHNSTON

YOURS...without charge!

THIS 64 PAGE MANUAL

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SUBSIDIARY OF PITTSBURGH PLATE GLASS COMPANY
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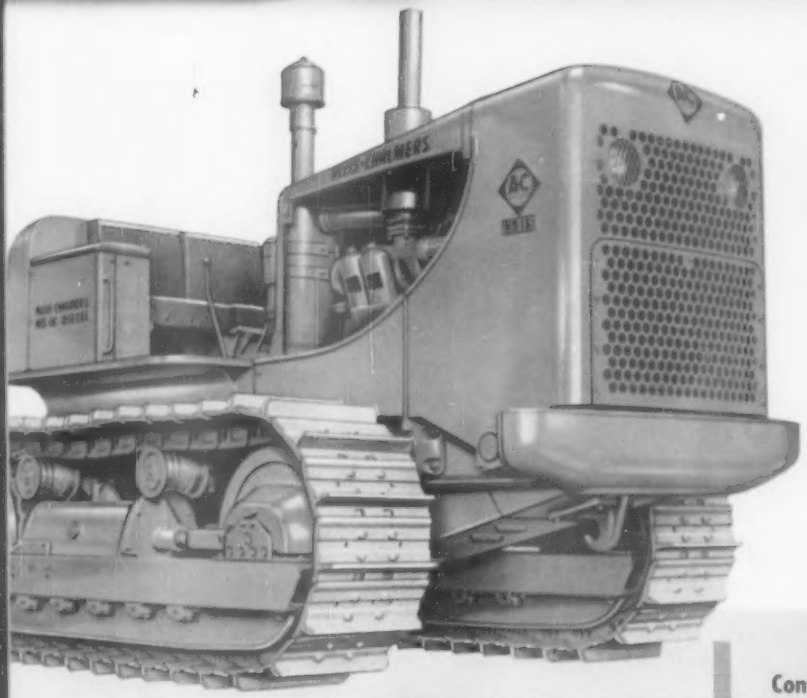
and its Commercial Chemicals Division



Allis-Chalmers presents the NEW HD-16

Your choice of two outstanding drives

	Torque Converter Drive	Standard Transmission Drive
Horsepower	150 net engine hp	131 belt hp
Weight	31,600 lb	31,500 lb
Drawbar pull	up to 60,000 lb *	up to 35,945 lb *

*Limited, under normal tractive conditions, to 9/ percent of total weight of tractor and mounted equipment

New Standards of Performance *for a wide range of heavy-duty work*

Set your sights on an HD-16! This big new tractor not only brings you *more* power for bigger jobs . . . it makes more effective use of horsepower, with a brand new Allis-Chalmers diesel engine and your choice of two new drives — the job-proved torque converter or the easy-shift standard transmission. Either way, the HD-16 brings you a new high in tractor-operator efficiency . . . a new high in work done under even the toughest conditions.

New Standards of Dependability *under all conditions!*

The HD-16 follows the Allis-Chalmers *advanced basic design*, with such important features as its all-steel, Box-A frame and one-piece steering clutch and final drive case...straddle-mounted final-drive gears with tapered roller bearings . . . unit construction . . . . . simplified lubrication and service designed with *better* maintenance in mind. What's more, it is newly engineered to provide big safety factors in all components . . . plus features like the new Allis-Chalmers heavy-duty diesel engine, new "wrap-around" radiator guard, husky new transmissions, new true-dimension track, and many others.

☆ ☆ ☆

All in all, the new Allis-Chalmers HD-16 brings you an outstanding combination of performance and long life with both mounted and drawn equipment . . . a higher rate of production, more working time, more work done, LOWERED JOB COSTS.

ALLIS-CHALMERS

TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

Clean, precision-formed, free-running threads save time, hold tight.
Close-tolerance nut-to-bolt fit.
Special Analysis steel for greater strength and holding power.
Tough, precision-shaped heads defy mutilation and wrench slippage.

SHEFFIELD

ARMCO

Bolts and Nuts

The Oil Industry's Biggest "Small Parts"

The number of bolts and nuts used annually by the oil industry defies calculation. Yet every bolt and nut assembly is a miniature machine which must be precisely made of quality materials to do best its vital job of holding things together.

Sheffield bolt and nut making "know how" goes back 67 years. We started when Colonel Edwin Drake's world's first oil well was still something of a curiosity. So Sheffield has grown up with the oil industry, supplying it top level quality bolts and nuts in greater quantities every year—for thousands of uses in drilling, production, lease maintenance, and refining. Sheffield makes them from furnace to finished product, and closely controls quality every step of the way.

Whatever your operation in the petroleum industry, you can be sure of finest bolt and nut quality by specifying Sheffield.

Now packed in sturdy labeled cartons. Just pull out the flap and remove bolts without taking box from shelf.

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DIVISION
ARMCO STEEL CORPORATION
SHEFFIELD PLANTS: HOUSTON • KANSAS CITY • TULSA

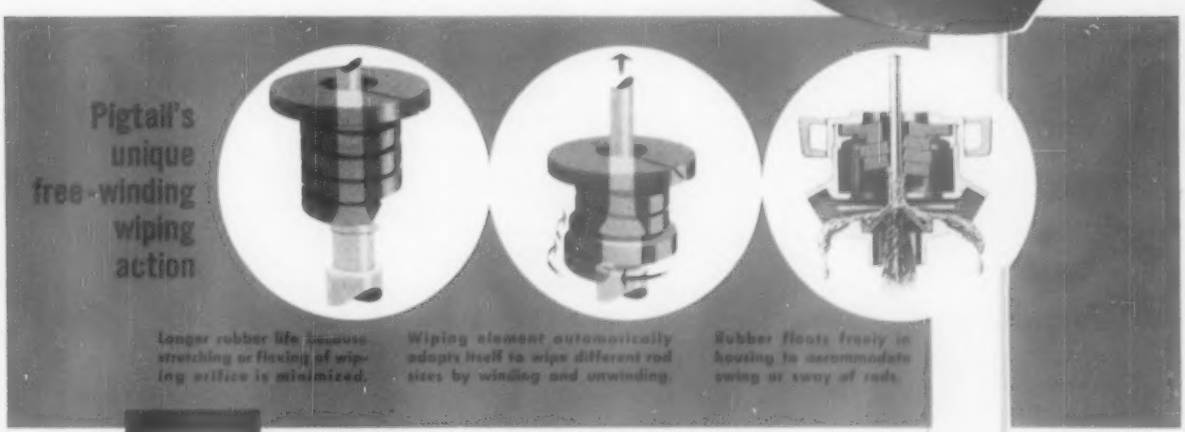
new free-winding wiping action!...

PB PIGTAIL
sucker rod wiper

- Winding action adjusts wiper to any rod size
- One wiper covers all sizes . . . including tapered or combination strings
- Easily installed without breaking rod string
- Also wipes macaroni tubing

GIVES YOU A CLEAN STRING OF RODS

This new PB Pigtail Wiper cleanly wipes water, oil, paraffin, or wax off rod upsets, wrench squares, sucker rod protectors, pump and guides, and macaroni tubing. Leaves no streaks. Rubber fits existing housings with flanged adaptor ring to prevent wiper rubber from pulling down into tubing. Self-adjusting feature prolongs rubber life.


Pigtail's unique free-winding wiping action
Longer rubber life because stretching or flexing of wiping orifice is minimized.
Wiping element automatically adapts itself to wipe different rod sizes by winding and unwinding.
Rubber floats freely in housing to accommodate swing or sway of rods.

For further information and details, write for Bulletin No. BJO-691

BJ SINCE 1872

Byron Jackson Co.

PB DIVISION

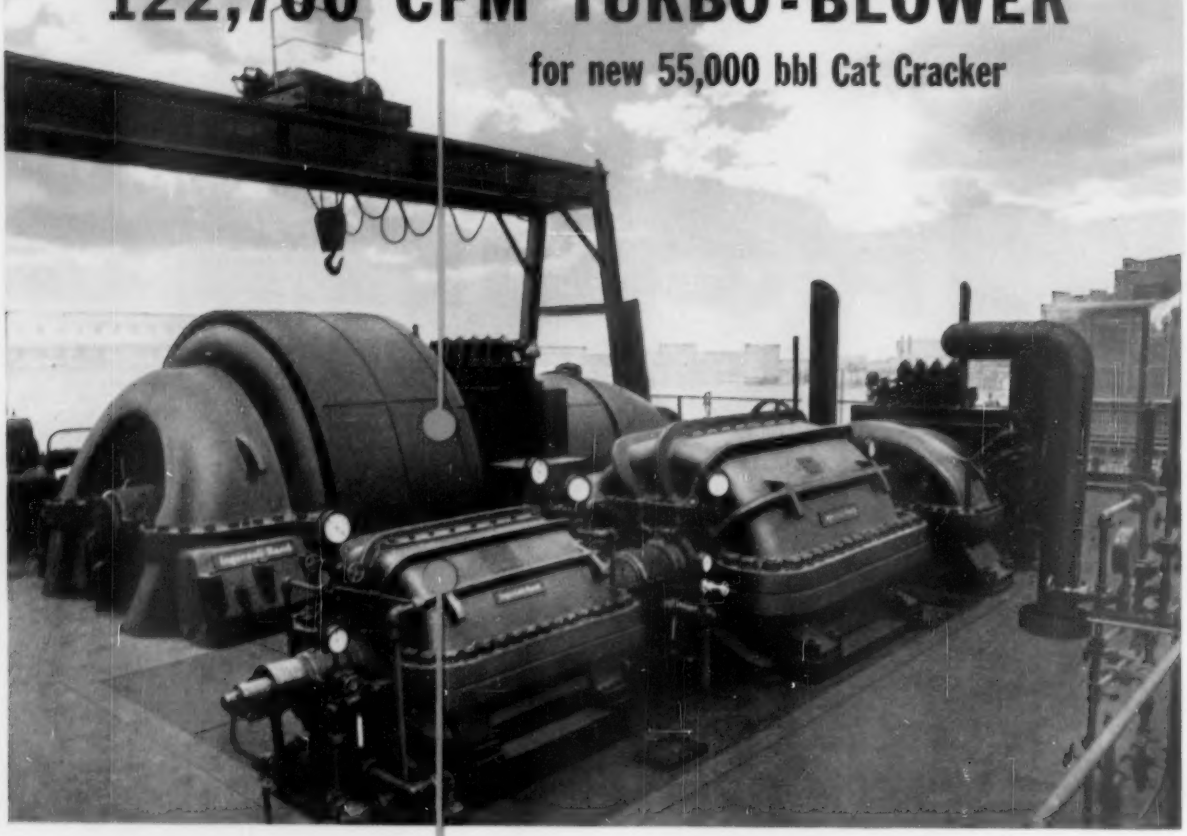
P.O. BOX 2493, TERMINAL ANNEX, LOS ANGELES 54, CALIFORNIA

Sales engineers in all principal oil fields

Standard Oil Company of California installs

122,700 CFM TURBO-BLOWER

for new 55,000 bbl Cat Cracker



Outdoor Installation at El Segundo Refinery also includes the world's largest centrifugal gas compressor in catalytic service ... both by Ingersoll-Rand

THIS INSTALLATION at Standard Oil Company of California's huge El Segundo refinery is unique in three respects.

The 122,700 cfm I-R Turbo-Blower shown in the background is one of the largest ever supplied for refinery service. It is a 3-stage unit, driven by an I-R 10,000 hp steam turbine, delivering air at 19.35 psig to the 55,000 barrel per day cat cracker.

In the foreground is the largest centrifugal refinery gas compressor in the world — a 6370 hp I-R unit consisting of two centrifugals in tandem, driven by an I-R turbine. Compressing gas from 4 psig to 205 psig, it delivers 20,800 cubic feet per minute.

The entire installation is out of doors.

Whatever *your* requirements for refinery air or gas compression, Ingersoll-Rand's unequalled experience and facilities are at your service.

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COMPRESSORS • AIR TOOLS • ROCK DRILLS • TURBO-BLOWERS • CONDENSERS • CENTRIFUGAL PUMPS • DIESEL AND GAS ENGINES

SINCLAIR OIL CORPORATION

says

OK

in print

Thriftiest Boiler
in the business
ANOTHER SINCLAIR FIRST!
SINCLAIR OIL CORPORATION • 600 FIFTH AVENUE • NEW YORK 20, N. Y.
SINCLAIR

Sinclair Oil Corporation pioneered a new boiler to secure greater efficiency in refinery operation. This advertisement from the Oct. 16, 1954 Business Week emphasizes the results obtained with this unit.

This B&W Carbon Monoxide Boiler, installed to absorb the heat from the exhaust gas stream of Sinclair's new Houston fluid cracking unit, was the first of its kind to go into refinery service. Here are the operating results:

Gas weight to boiler—lb per hr	650,000
Gas temperature to boiler—	990
Per cent CO in gas stream to boiler—, % by volume	4.8
Steam from sensible heat and combustible in cracking unit exhaust gas—lb per hr	220,000
Total steam capacity, boiler and economizer—lb per hr	330,000
Btu saved from cracking unit gas stream—Btu per hour	218,000,000

The Babcock & Wilcox Company, Boiler Division
161 East 42nd Street, New York 17, N. Y.

BABCOCK & WILCOX

BOILER DIVISION

G-700

PLS-GREGGTON (Longview)

Transit point for protecting steel pipe in the East Texas area

Typical of the under-roof facilities is this PLS-designed cleaning and priming equipment. Shot-cleaning is an extra preparatory step which assures a perfect bond between the bare pipe and protection applied.

There's no short-cut to the kind of cleaning, priming, coating and wrapping that will give your steel pipe the quality protection it needs in underground service. As a pioneer in coating and wrapping, PLS knows from long experience that only modern, *under-roof* facilities can assure the proper control of every phase of the protection process. That's why PLS maintains seven complete plants such as the new larger plant at Greggton (Longview), Texas. Located on the Texas & Pacific Railroad, this plant covers 22 acres and offers the most advanced type service including transit privileges for pipe users in the southwest area.

PLS

Dependable Service since 1931

PIPE LINE SERVICE CORPORATION

Pioneers in Steel Pipe Protection

General Offices and Plant: Franklin Park, Illinois

Plants also at Glenwillard, Penna.; Greggton (Longview), Texas; Corpus Christi, Texas; Harvey, La.; Sparrows Point, Md.; and Monmouth Junction, N.J.

They Say—

An Author Corrects Us

Dear Sir:

Thanks very much indeed for the separate prints of my Savanna Creek article. *The Oil and Gas Journal, June 6, page 172.*

The excellent art work and photo cut, also the editing, in part, certainly improved the piece.

It was unfortunate that the word "prior" (page 173, third paragraph from bottom, column three) was substituted in one case and "true" (page 175, second paragraph, column one) in the other, in place of the word "subsequent" as written by me in the text furnished for copy. The folding SUBSEQUENT to the faulting is, of course, a feature of great interest and significance.

Joseph S. Irwin, E.M.
Consulting Geologist
Calgary

Another "Tidelands" Wave

"At the present time, as in the past, and as they will be in the future, the states Senator Douglas (D-Ill.) would deprive of their offshore lands (by introducing in Congress a bill to that effect) have no intention of yielding an inch to those forces in and out of Congress who want to reopen the 'tidelands' dispute.

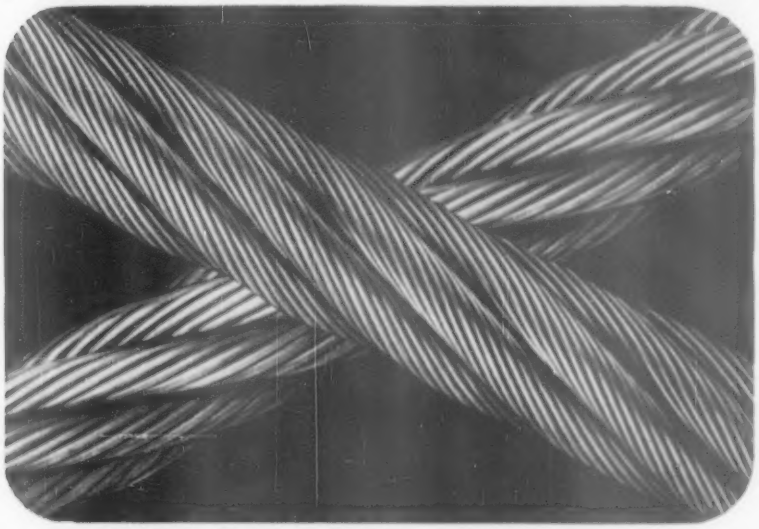
"Mr. Eisenhower signed the 'tidelands' bill in May of 1953 because he agreed with citizens of the coastal states and most of the people of the South . . . that 'federal encroachment upon rights and affairs of the states' should be resisted. He has not changed his mind, and is not likely to do so.

"While the Supreme Court in some of its rulings has taken what New Dealers are pleased to call a 'liberal' attitude, the court said last year Congress has the power to dispose of property belonging to the United States.

"This decision, unless the court reverses itself—and it has been known to reverse itself—would seem to place an insurmountable barrier to any further attempts to take from the states their offshore lands and give them, as the New Dealers and Socialists say, 'back to the American people.' Since the American people never owned the 'tidelands' in the first place, giving them 'back' to the people is impossible.

"Behind all the fire and smoke generated in past years by the 'tidelands' controversy is the determination of state socialists not to 'give' the Amer-

FIRST WE DEVELOPED 1105 ROPE WIRE.



THEN WE MADE ROEBLING'S

Royal Blue

WIRE 1105 ROPE

1105 takes Royal Blue out of the ordinary wire rope class.

1105 is a rope wire that's new—that's stronger. It's the biggest news in many years.

1105 is the result of more than a century of research and development—it's the wire that gives Roebling Royal Blue the stamina that pays off in service.

Contact your Roebling distributor or write us for the full story.

ROEBLING

Subsidiary of The Colorado Fuel and Iron Corporation

JOHN A. ROEBLING'S SONS CORPORATION, TRENTON 2, N. J. BRANCHES: ATLANTA, 934 AVON AVE. • BOSTON, 51 SLEEPER ST. • CHICAGO, 5525 W. ROOSEVELT RD. • CINCINNATI, 3253 FREDONIA AVE. • CLEVELAND, 13225 LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON ST. • DETROIT, 915 FISHER BLDG. • HOUSTON, 6216 NAVIGATION BLVD. • LOS ANGELES, 5340 E. HARBOR ST. • NEW YORK, 19 RECTOR ST. • ODESSA, TEXAS, 1920 E. 2ND ST. • PHILADELPHIA, 230 VINE ST. • SAN FRANCISCO, 1740 17TH ST. • SEATTLE, 900 1ST AVE. S. • TULSA, 321 N. CHEYENNE ST. • EXPORT SALES OFFICE, 19 RECTOR ST., NEW YORK 6, N. Y.

Flexible fins can

E-Z Tubing Swab

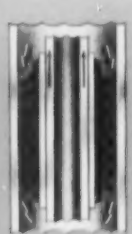
. . . and ***Mission E-Z Tubing*** and ***Casing Swabs*** with flexible fins can save a "fish" for you. ***Mission E-Z Swabs*** fall easily through tight or rough spots in casing or tubing. The flexible fins on ***Mission E-Z Swabs*** can't overload, thus practically eliminating line breakage and junk in tubing or casing. This "built-in" overload relief feature, exclusive with ***Mission E-Z Swabs,*** eliminates the necessity of purchasing special overload relief valves.

You can select the amount of fluid to be lifted by using one, two or three rubbers. For ***Greater Safety, Better*** and ***Faster Swabbing*** and ***Lower Costs*** operators are standardizing on ***Mission E-Z Tubing*** and ***Casing Swabs.*** Like all other ***Mission*** products, these ***E-Z Swabs*** are guaranteed to be more economical than any other swabs you are now using or the entire purchase price will be refunded.

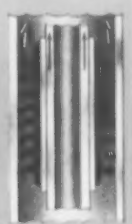
Available through all supply stores—everywhere.

On the down stroke fins are in normal upturned position, allowing E-Z Swab to fall free.

Flexibility of fins allows E-Z Swab to pass smoothly through tight spots on up or down stroke.



When operator tries to pull too much fluid, the Mission E-Z Swab rubber fins bend down and by-pass excess fluid. This safety relief action prevents overloads and broken wire lines.



After overload fluid is passed, fins spring up and seal against tubing.

Nothing but the finest will bear the name of

SLUSH PUMP VALVES • VALVE SPRINGS • VALVE SEAT PULLERS • PISTONS • PISTON RODS

save a fish !

MISSION
MANUFACTURING CO.

P. O. BOX 4209 • HOUSTON, TEXAS • EXPORT OFFICE: 30 ROCKEFELLER PLAZA, NEW YORK

LINERS • GLAND PACKINGS • SLIPS • SWABS • CENTRIFUGAL PUMPS • PLUG VALVES

GOING PLACES *underground with Cities Service...*

Cities Service transported more oil through more miles of pipeline in 1954 than ever before in Company history. Reason for this bustling underground activity—more Cities Service customers than ever before in Company history!

CITIES SERVICE

A Growth Company

Number 11 of a series

ican people anything but to turn over the rich resources of oil and gas of coastal states to federal bureaucracy, which would administer them in the high-handed manner peculiar to federal bureaucracy."

Editorial in Beaumont, Tex., Enterprise.

Bigger Demand Forecast

"Our present and future sources of energy—coal, hydroelectricity, atomic power and oil—are more supplementary than competitive. There is a steady increase in industrial production in Britain and a consequent increased need for power which coal is not meeting, and which is much too near for atomic energy to meet.

"Last year, Britain's total energy consumption was equal to 250,000,000 tons of coal, of which coal actually provided about 86 per cent and petroleum, 14 per cent.

"In 1964, energy consumption will be up to 295,000,000 tons, at least. Atomic power in 10 years time will release the equivalent of about 5,000,000 tons. Even if coal production is increased, Britain will need about 280,000,000 more barrels of oil per year for industrial energy by 1964.

"This demand will be upon the entire petroleum industry . . . the last industrial revolution was founded on coal; tomorrow's prosperity will depend largely on oil."

Sir Leonard Sinclair, chairman of Esso Petroleum, Ltd., in a statement following an agreement with British Central Electric Authority by which Venezuelan fuel oil will replace coal as the fuel for seven major power stations.

Shortage of Civil Engineers

"It's a disturbing fact that, while our engineering colleges are increasing in enrollment, the number of these students planning careers in civil engineering is falling behind. We can already foresee the day when the shortage of new civil engineers will be crucial."

J. E. Buchanan, president of the Asphalt Institute, at the group's board of directors' meeting at Colorado Springs.

Clear Understanding of Geophysics

Dear Sir:

I wish to commend you on your very excellent article in the June 20, 1955, issue of The Oil and Gas Journal entitled "Geophysics Can Find More Oil for You."

Your article indicates a very clear understanding of what geophysics can do for the industry and your examples

THIS battery of "Automatic" Sprinkler SUPROTEX-DELUGE valves is assurance of intensive fire-fighting power for this fluid catalytic cracking unit.

Heat-sensitive Rate-of-Temperature-Rise detectors, located throughout the superstructure of the plant, feel fire at inception. Then, in but a matter of seconds, scientifically engineered "Automatic" FIRE-FOG systems take over. Alarms sound, location of the blaze is determined, and fire control or extinguishment is an instantaneous accomplishment.

FIRE-FOG is but one of many advanced types of ENGINEERED Special Hazard PROTECTION developed by "Automatic" Sprinkler Corporation of America. Research into the cause of disastrous fires, endless testing, and much practical field experience has enabled us to design, manufacture, engineer and install the specific type of protection needed to combat every fire hazard. Fixed piping systems of "Automatic" Sprinklers, water spray, high and low pressure CO_2, Air Foam, Dry Powder and Chemical Foam stand guard over leading petroleum and chemical processing properties throughout the Western Hemisphere.

Our highly trained staff of Special Hazard engineers will gladly assist you in the development of a fire-safe, investment-saving future for your business. Write or call us for service today.

"Automatic" Sprinkler
CORPORATION OF AMERICA
YOUNGSTOWN, OHIO

Offices in Principal Cities of North and South America

LONGER
THREAD LIFE
IN EVERY BUCKET!

MONEY BACK GUARANTEE

MONEY BACK GUARANTEE

Sold through your favorite supply store

Use JIMMIE GRAY Dope Brushes!

PETROLEUM DISTRIBUTING COMPANY

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Quality Oil Field Lubricants Available in LA. • MISS. • TEX. • N.M. • N.D. • WYO.

are most noteworthy. We of the geophysical industry are plagued with a rather inconsistent theory being sponsored by those on the exploration side and such articles as yours may well serve as a push-off toward more and particularly better geophysics.

J. F. Garner
President
Tulsa Exploration Co.
Tulsa.

CALENDAR

JULY

29 Southern Gas Association, dispatchers round table conference, Rice Hotel, Houston.

AUGUST

15-16 North Dakota Oil and Gas Association, annual meeting, Bismarck, N. D.

15-17 Society of Automotive Engineers, golden anniversary West Coast meeting Hotel Multnomah, Portland, Ore.

19 Southern Gas Association, transmission section round table on pipeline engineering, natural-gas gathering and processing, and pipeline operations and maintenance, Hotel Adolphus, Dallas.

29-31 15th annual Appalachian Gas Measurement Short Course, West Virginia University, Morgantown, W. Va.

26-Sept. 15 Graduate summer session in reservoir engineering, University of Texas, Austin.

SEPTEMBER

2-3 Association of Desk and Derrick Clubs of North America, fourth annual convention, Commodore Hotel, New York City.

11-13 Independent Natural Gas Association of America, annual meeting, Jasper Park Lodge, Jasper Park, Jasper, Alberta, Canada.

12-14 American Institute of Electrical Engineers, electrical conference of the petroleum industry, Shamrock Hotel, Houston.

12-16 Tenth National Instrument Conference and Exhibit, Los Angeles, Calif.

12-16 Second International Instrument Congress and Exposition and tenth National Instrument Conference and Exhibit, Shrine Auditorium, Los Angeles.

14 American Association of Petroleum Geologists Western Canada regional meeting, and Alberta Society of Petroleum Geologists 5th annual field conference, Jasper Park Lodge, Jasper National Park, Alberta.

14-16 National Petroleum Association, 53rd annual meeting, Traymore Hotel, Atlantic City, N. J.

14-17 American Association of Petroleum Geologists, western Canada regional meeting and fifth annual field conference of Alberta Society of Petroleum Geologists, Jasper, Alberta, Canada.

22-23 Western Petroleum Refiners Association, regional technical-industrial relations meeting, Hotel Henning, Casper, Wyo.

22-23 Louisiana - Arkansas Division, Mid-Continent Oil and Gas Association annual membership meeting, Roosevelt Hotel, New Orleans.

25-28 American Society of Mechanical Engineers, Petroleum Mechanical Engineer-

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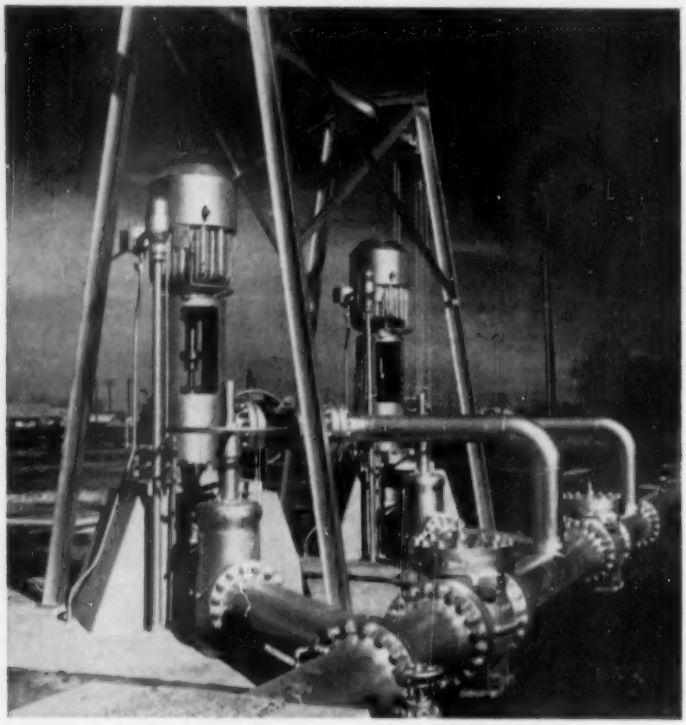

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ing Conference, Roosevelt Hotel, New Orleans.

26-28 American Association of Oilwell Drilling Contractors, fifteenth annual meeting, Rice Hotel, Houston.

26-28 American Institute of Chemical Engineers, fall national meeting, Lake Placid Club, Lake Placid, N. Y.

29 Natural Gasoline Association of America, Oklahoma regional meeting, Skirvin Hotel, Oklahoma City.

OCTOBER

2-5 American Institute of Mining and Metallurgical Engineers, Petroleum Branch, fall meeting, Roosevelt Hotel, New Orleans.

2-6 American Society for Testing Materials, Committee D-2, petroleum products and lubricants, Statler Hotel, Washington, D. C.

3-4 Texas Mid-Continent Oil and Gas Association, 36th annual meeting, Baker Hotel, Dallas.

3-6 Society of Exploration Geophysicists, 25th annual meeting, Shirley Savoy Hotel, Denver.

3-6 Rocky Mountain Association of Petroleum Geologists and Denver Geophysical Society, 25th annual meeting, Denver.

9-15 American Petroleum Institute, Oil Progress Week.

12-14 Gulf Coast Association of Geological Societies, annual meeting, Buena Vista Hotel, Biloxi, Miss.

12-14 Gas Appliance Manufacturers Association, El Mirador, Palm Springs, Calif.

12-14 National Association of Corrosion Engineers, sixth biennial Permian basin tour, Lincoln Hotel, Odessa, Tex.

13-14 California Natural Gasoline Association, annual fall meeting, Ambassador Hotel, Los Angeles.

14 American Institute of Chemical Engineers, South Texas Section, 10th annual technical meeting, Galvez Hotel, Galveston, Tex.

14-15 National Society of Professional Engineers fall meeting, Peabody Hotel, Memphis, Tenn.

17-19 American Gas Association and Pacific Coast Gas Association, annual meeting, Ambassador, Biltmore, and Statler Hotels, Los Angeles.

18-22 National Safety Council, 43rd National Safety Congress and Exposition, Chicago.

20-21 Western Petroleum Refiners Association, regional technical-industrial relations meeting, Garrett Hotel, El Dorado, Ark.

24-27 National Association of Railroad and Utilities Commissioners, natural gas panel discussion, Asheville, N. C.

27-29 Rocky Mountain Oil and Gas Association, annual convention, Cosmopolitan Hotel, Denver.

28 Natural Gasoline Association of America, southern regional meeting, Captain Shreve Hotel, Shreveport.

31-Nov. 1 Independent Petroleum Association of America, annual meeting, Jefferson Hotel, St. Louis.

31-Nov. 2 National Lubricating Grease Institute, annual meeting, Edgewater Beach Hotel, Chicago.

NOVEMBER

2-4 Society of Automotive Engineers, diesel engine meeting, Chase Hotel, St. Louis.

2-4 American Association of Petroleum Geologists, Mid-Continent regional meeting, Skirvin Tower, Oklahoma City.

Top Speed—Top to Bottom—with One Rig!

Pictured: Model RS-43—drills to 3500' with cable tools, to 3000' with 3½" drill pipe. All models are available either with a detachable section on which is mounted the rotary table (above), or with the rotary table unitized with the rig (below) and equipped with folding walkways and expanded metal flooring.

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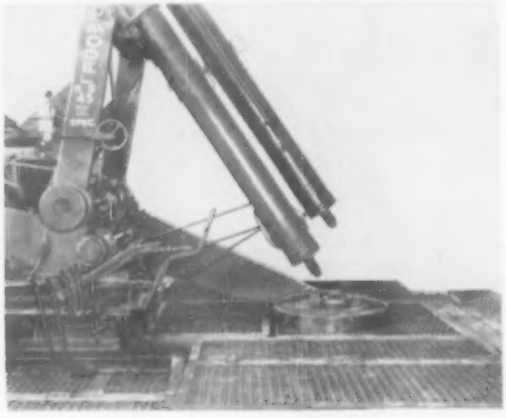

All Walker-Neer "S" Model spudders, and some "C" Model spudders, can be built as combination rigs, or easily converted to such. The rotary table and spudder are driven by the same engine. The casing drum of the spudder serves as the rotary draw works, and is available with grooved core if desired. The rotary attachment has a separate jaw or friction clutch. Hydromatic brakes and air clutches are optional.

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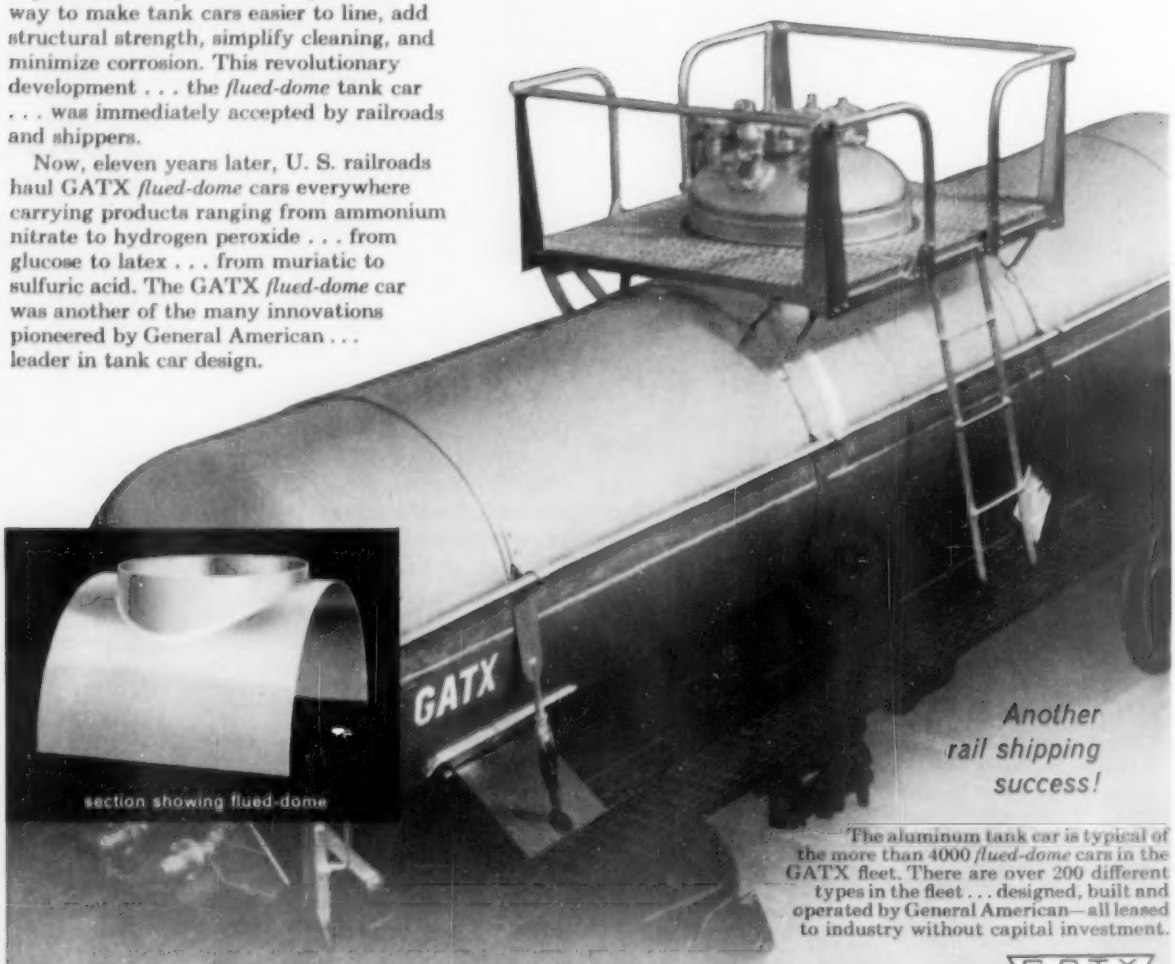

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JOURNALLY SPEAKING...

Babes in the Woods

AS soon as you finish reading this page, turn to the next most important thing in this issue—our midyear review and forecast statistical section.

There's everything you ought to know, figureswise, about where the industry has been, where it is at, and where it's headed. And if you're a part of the industry (and what are doing reading this magazine if you're not?) you'll want to know these things.

Figures are a pain in the neck to us and there are times when we wish they'd never been invented. (We often feel the same way about telephones, too.) But when it comes to oil-industry statistics we think about the fellow who was so close to the trees that he couldn't see the forest, and reason like this:

The average oil man is so busy with his own job and his own problems—so close to his own "tree"—that he seldom gets a chance to get back away from the underbrush and take a look at the petroleum industry as a whole—the "forest." So he wanders around in the woods, noting that some trees are growing big and others are staying little, some look pretty healthy and others are dying or rotting, but unable to determine from these individual specimens just what the condition of the whole tract is like.

That's where we come in with our statistical panorama. We sort of fly over the woods with an aerial camera, figure-atively speaking, paste the strip photos together, and parachute them down between our yellow covers onto the desks of the oil-men woodchoppers. So you don't need to be a babe in the woods. Leave off hacking at your own particular tree long enough to take a look at our picture of the forest, and then see how your tree is doing in comparison with all the rest.

Summer-Upper

INCIDENTALLY, every time we do a statistical whing-ding like this we try to improve the presentation so that the quick thumber-througher can get something out of them as well as the deep digger-upper.

This year we have a double-truck summary spread across two full pages just before the detailed articles begin. Then, for those who don't have time to read this summary, we have a summary of the summary on the first page of the section. But if you require a summary of the summary of the summary, here it is: Everything's up.

Varied Diet

JUST to make this issue of more value for permanent reference, and to be sure to please the slip-stick boys whose appetite for figures runs along technologic rather than economic lines, we also have included a whole slew of articles reviewing recent developments in engineering. Something in the pot for everybody, that's our motto.

Oil Soil Soil?

OIL-INDUSTRY research follows some astonishing paths. One of our spies reports that a big oil company down Houston way is embarking on some extended research to see how much punishment soil can take from waste oil and still function as soil for growing things.

The scientists are said to be mixing tank bottoms, separator sediment, and gooey clay from lube-oil filters with the soil and then disking it in with fertilizer and planting bermuda grass.

The objectives are reported to be to find out the amount of such wastes the soil can tolerate and still grow cover crops, how long it takes soil bacteria to restore the soil in case too much oil is dumped at one time, and how soon the process can be repeated. But our informant failed to state whether the company is planning on draining its sump pit onto somebody's pasture and wants to be ready to win a lawsuit about it.

He did say that so far the oil spoil may soil soil but not spoil soil, because the grass seems to grow better than ever. We could have told them that. Those researchers just ought to see the way the bermuda grass grows in the asphalted joints of our driveway.

—*Henry D. Ralph.*

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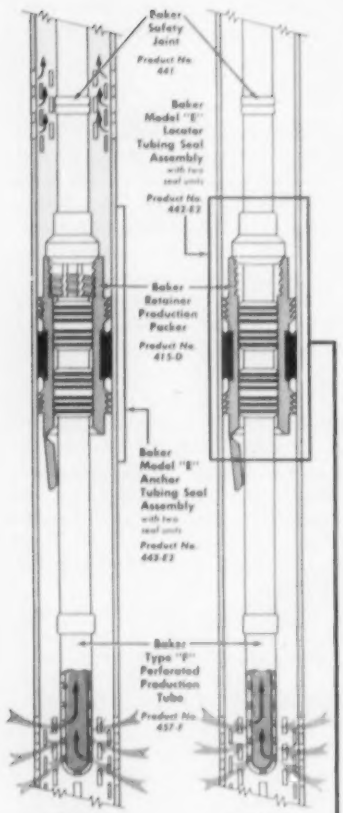
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Midyear 1955: Back in the groove

MIDWAY through 1955 it's obvious that this year is a good one for the entire petroleum industry.

Compared with last year, activity in every phase of the industry (except exports) is up, generally in the range of 5 or 6 per cent. There is every indication that things will continue this way well into the winter, and probably beyond.

It is a healthy growth, generally well proportioned and in step with demand. The industry is pretty well in balance, and there are few very sore spots. Oil men have good reasons to be optimistic.

BUT ONE THING MUST BE REMEMBERED in looking at the growth figures: 1954 was a rather poor year in many respects. Comparisons between this year and last year can give a distorted impression. For planning purposes it is much safer to look at 1955 in relation to the trends of the past 2 or 3 or more years.

From this viewpoint, 1955's percentage gains look smaller than when compared with 1954 by itself. It is also apparent that 1955 is just about in line with the trend of rising activity in all phases of the industry over a period of years.

For a generation or more the petroleum industry has been expanding at a remarkably even rate, despite wars and the cycles of general business. Every now and then there is a poor year, when activity remains virtually static or even slips backward a bit. But such periods are usually of short duration and are always followed by a year of greater-than-normal increases.

Last year was one of those "off" periods. This year is one of the "making-up" periods. The main reason why 1955 is so very much better than 1954 is that 1954 wasn't as good as it should have been according to the long-range trend.

And if the trend continues as in the past, 1956's gain over 1955 will not be as large, percentagewise, as 1955's gain over 1954. The difference may be small in percentage points, but at the present rate of activity, 1 per cent is a lot of barrels or a lot of well footage.

WE'RE BACK IN THE GROOVE, back on the long-range trend of demand increases of something like 4 per cent per year and roughly commensurate annual increases in activity of all divisions of the industry. That's the picture at midyear '55.

Operators should plan accordingly, both for the next few months and for the next several years. The slight slump of last year has been replaced by a little boomlet, but neither one is much more than a ripple on the steadily upward curve of demand for the industry's products and the industry's capacity to supply them. We're back to normal—which, for petroleum, means constant orderly expansion.

CHECK THE ADVANTAGES FOR OFFSHORE

DEPENDABILITY is an outstanding feature of Sikorsky helicopters. The commercial S-55 type, pictured here, has been proved by over 300,000 flight hours. Its rugged design and inherent safety are world famous. This is the same type helicopter used in airline passenger service, and is the only transport type approved by the government for commercial transport service.

SMOOTH FLIGHT is an advantage of helicopter transportation. S-55s eliminate the discomforts and hazards of rough and stormy seas. In offshore transportation, work crews fly to landing platforms on rigs or tenders. Dangerous surface transfers are unnecessary.

SPEED is a major advantage of helicopters in offshore transportation. S-55s have a cruising speed of 90 m.p.h. Trips between the shore and even the farthest rig at sea take only minutes.

OF SIKORSKY HELICOPTERS TRANSPORTATION

DAY IN AND DAY OUT, the advantages of offshore transportation by big Sikorsky helicopters are being demonstrated in regular service for major oil companies. For more than a year, S-55s have flown work crews, executive and supervisory personnel, and cargo to offshore drilling rigs in the Gulf of Mexico.

Float-equipped S-55s are unaffected by tides or by rough seas. They are fast, dependable, and efficient in routine offshore service, and unexcelled in emergencies. Wherever transportation is a problem—in the Gulf of Mexico, Lake Maracaibo, the Persian Gulf or anywhere—Sikorsky helicopters are the world's most versatile vehicles, for they can carry men or cargo, and fly from land or sea or marshlands with equal ease.

Get full information on the advantages of helicopter transportation in industry. Write today to B. L. Whelan, general manager of Sikorsky Aircraft, or telephone him at EDison 4-1071, Bridgeport, Connecticut.

IN EMERGENCY, helicopters provide the swiftest transportation to shore or hospital. In accident cases, litter patients can be loaded directly into S-55s on the helicopter landing platforms, and flown direct to hospitals. During the past year they have saved a number of lives.

VERSATILITY of rugged Sikorsky helicopters makes them ideal for transportation to operations in the inland marshes, as well as to rigs offshore. Float-equipped S-55s can make many trips in the time usually needed for one by the ordinary slow surface means. They can operate efficiently from land or sea or marsh, carrying 8 to 10 people, or nearly a ton of cargo.

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THIS WEEK . . . . . IN THE NEWS

Processing

• Refiners may see a trend in plans of two southwestern plant operators to incorporate catalytic reforming in their gas processing. Texas Gas Corp. and Southwest Gas Producing Co. will upgrade the low-octane fraction of their distillate to a minimum 95 research octane number, leaded reformate. This should put field distillate back into the running as a motor-fuel blend.

• U. S. Oil & Refining Co. has announced plans to give the State of Washington its third refinery in 2 years. The president of the new firm, a retired Standard of California refining manager, says the new 15,000-bbl. plant will be equipped with modern catalytic processes.

Production

• A million-dollar pilot thermal-recovery project is being started by General Petroleum Corp. in California's South Belridge field. It is the first application of the "fire floods" to heavy California crudes.

• The Texas Railroad Commission soon will decide whether to increase gas-oil ratio limit for ailing Spraberry Trend Area field to 4,000:1. The commission is expected, however, to turn down request by Phillips Petroleum Co. for new field rules setting allowables on lease basis.

Petrochemicals

• The synthetic-ammonia business is proving attractive to two more oil firms—Continental and Cities Service. The pair last week bought a part interest in Mid-South Chemical Corp. and plan later to acquire all of the firm on a 50-50 basis. Future plans also call for Conoco-Cities Service to build a 275-ton per day anhydrous ammonia plant near their Lake Charles, La., refineries.

• Texas Butadiene & Chemical Corp. plans to build a $26 million combination avgas-alkylate and butadiene plant at Houston with government help. The Armed Services Petroleum Purchasing Agency gave the firm a "facility expansion contract." The ASPPA thus gets first call on the avgas-alkylate products and underwrites standby maintenance costs if the plant is forced to shut down for lack of markets in the first 5 years.

Exploration

• The C.A.T.C. group apparently has a producer in the deepest waters ever challenged by a drilling rig. The group's wildcat in the Grand Isle area off Louisiana found 119 ft. of commercial oil shows and 46 ft. of gas in eight Miocene sands between 9,845 and 14,021 ft. Drilling was in 97 ft. of water, 12 miles from nearest production.

• Amerada has the first production in the Williston basin from the Spearfish formation. The Bottineau County wildcat gives the Williston production from eight geologic ages.

• Union Oil Co. of California has a gas-distillate discovery in Beaver County, Oklahoma. It extends the trend in that active area 8 miles southwest.

International

• The exploration race is waxing hotter in Cuba. Stanolind Oil & Gas Co. is negotiating for concessions on 8,600,000 acres to conduct the biggest drilling program since the 1954 boom was touched off. The plan is for Stanolind to sink 40,000 ft. of hole during each of the next 5 years.

• An all-out search for oil is expected to be in progress in Libya before the end of the year. At least nine international oil companies will probably apply for concessions this week. The action is the result of Libya's new petroleum law.

Natural Gas

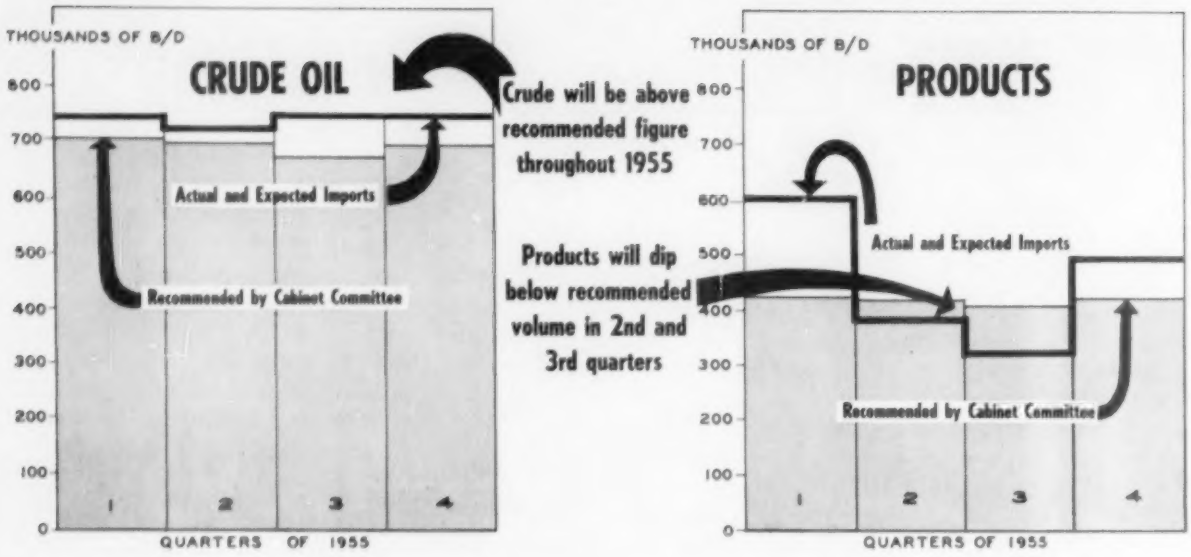
• The natural-gas pipeline boom is rolling ahead. This year will be the second biggest in history for spending on new facilities. And another billion-dollar year is in prospect, even though the pace may let up.

• Congressional leaders hope to make at least a good start this session on enactment of the Harris gas bill. It may be brought up late this week in the House, where a poll indicates it could pass. But time is running out, and the bill may be laid over until next year.

Imports

• The flow of foreign crude and products is running above the levels recommended by the cabinet committee. Study indicates crude imports for year will be about 11.05 per cent of domestic crude production. Product imports, down in second and third quarters, will average 6.72 per cent of crude production for year.

• Imports averaged 1,140,000 bbl. daily during May, Census Bureau reports, up 20,000 bbl. from April and 174,000 bbl. above May of 1954. Crude imports during May averaged 739,000 bbl. daily and products 401,000 bbl. Included was a new record of 33,000 bbl. daily from Canada.



Will 1955 Imports Be Excessive?

- They're running higher than the cabinet committee's recommendation, and will for the rest of this year
- But the key question is whether they'll exceed the suggested level "significantly"; only Washington knows

Henry D. Ralph and John C. Casper

IMPORTS of foreign oil so far this year have been above the level recommended by the President's cabinet committee. Indications are that they will continue above that level during the remainder of the year.

Whether current imports exceed the recommended levels "significantly"—the word used in the report—is a question now before the Office of Defense Mobilization for decision.

Under the cabinet committee's recommendation, imports of crude should not significantly exceed 10.34 per cent of domestic production, and imports of residual fuel oil should not significantly exceed 6.24 per cent of domestic crude production.

Figures available . . . The industry now has half-year figures on imports and production, and good forecasts for the last half of this year. This permits a checkup on imports performance for 1955.

This checkup indicates that crude imports for the full year will average 742,000 bbl. per day, or 11.05 per cent of 1955 domestic production. The cabinet committee's recommended percentage of 10.34 would "allow" only 694,000 bbl. per day. So it appears that this year's crude imports will be 48,000 bbl. per day above the recommended level.

Products imports are expected to average 451,000 bbl. per day this year, or 6.72 per cent of domestic crude production. The cabinet committee's recommended percentage of 6.24 per cent would work out to 419,000 bbl. per day. So products imports are running 32,000 bbl. per day above the recommendation.

This is shown in detail by quarters, and also for the full year, in the first table. The "performance" figures for the first quarter are actual. Those for the second quarter are partly estimated from preliminary reports. Those for the third and fourth quarters are extrapolated from schedules filed by importers with the Texas Railroad Commission and other sources. Figures for domestic crude production are from the Journal's midyear forecasts. *(See pages 154 and 155 of this issue.)*

To secure exact compliance with the cabinet committee's recommendations it would be necessary to use figures for imports of residual fuel oils only instead of for all products. These "other products," which fluctuate considerably but normally run around 10 per cent of products imports, were ignored by the cabinet committee report. Leaving them out of the computations would reduce the volumes of products imports and total imports, but would not alter the percentage ratios materially.

Resid demand static . . . There are two reasons why crude imports and products imports should be considered separately instead of making comparisons on the basis of total imports. One is because that is the basis used by the cabinet committee.

The other is the nature of the two classifications and their impact on the domestic oil industry.

The demand for resid has been almost static ever since the end of the war. Consumption has increased slightly, but the percentage increase is almost negligible when compared with the increase in demand for all petroleum products.

Meanwhile, domestic production of residual fuel oil has been declining. Refinery runs of crude have increased but the yield of resid has dropped. Refiners have found ways of turning a higher percentage of crude into products which sell for more money than resid. Therefore imports of resid have been increasing in order to fill the gap in demand which was abandoned by domestic refiners. Thus a good case can be made for saying that imports of resid, considered alone, supplement but not supplant domestic production of resid.

This year, however, the high level of industrial activity has increased the demand for resid. During the first half of 1955 it was up more than 7 per cent above the first half of 1954. However,

actual production of resid in this country declined. Therefore, imports increased in order to fill the demand. Arguments might be raised as to which is cause and which is effect. But there are strong indications that refineries would not have turned much, if any, more domestic crude into residual fuel oil even if imports had not increased.

Competing fuels . . . Imported residual fuel oil may have a bearing on sales of bituminous coal and natural gas for industrial purposes, but it can be argued with good cause that imported resid competes only indirectly and to a small extent with domestic crude oil.

On the other hand, imported crude oil is directly competitive with domestic crude oil. Crude imports do not fluctuate seasonally nor with over-all changes in demand nearly so much as imports of resid. From the standpoint of the domestic crude-producing industry, it is imports of crude, rather than of resid, that should be watched for the undesirable effects mentioned in the cabinet committee report.

Why the Confusion?

There is considerable confusion in the industry as to just how much imports have increased.

The reason: Spokesmen for both importers and domestic producers have been issuing figures computed in almost every possible way—except by the formula of the cabinet committee report.

Most people lump the recommendations for crude and resid together and come out with a figure of 16.5 or 16.6 per cent, which they feel should be the limit of all imports.

This is not the way the cabinet committee stated the formula and can lead to some confusion due to seasonal fluctuations in resid imports.

Another deceptive approach is to make comparisons on too short a period, such as for a month or a quarter. For instance, residual imports are always lower in the summer. Anyone is misleading, then, who uses figures for total imports and says, in effect, "Wait and see what happens during the next few months." Lower resid imports during the second and third quarters will naturally bring down the ratio of total imports to crude production during the summer. Meanwhile, crude imports are scheduled to continue at a more or less steady rate, and resid imports will rise sharply during the fourth quarter.

Language ignored . . . The reason for wide disparities among various imports comparisons issued in recent weeks is that many compilers either misinterpreted or ignored the language used by the cabinet committee.

For example, some have applied the

How 1955 Imports Will Compare With Recommended Level

(Thousands of barrels daily)

	U. S. crude prod.	Crude imports — Volume	Crude imports — Per cent of crude prod.	Product imports — Volume	Product imports — Per cent of crude prod.
First quarter:					
Recommendation		706	10.34	426	6.24
Performance	6,827	744	10.90	604	8.85
Second quarter:					
Recommendation		699	10.34	422	6.24
Performance	6,759	725	10.73	384	5.68
Third quarter:					
Recommendation		678	10.34	409	6.24
Performance	6,555	750	11.44	330	5.03
Fourth quarter:					
Recommendation		694	10.34	419	6.24
Performance	6,710	750	11.18	490	7.30
Year (1955):					
Recommendation		694	10.34	419	6.24
Performance	6,712	742	11.05	451	6.72

The Ratio of Imports to Production Is Still Climbing

(Thousands of barrels)

Year	Crude prod.	Crude imports	Per cent crude imports of crude prod.	Product imports	Per cent product imports of crude prod.
1947	1,856,987	97,532	5.25	61,857	3.33
1948	2,020,185	129,093	6.39	59,051	2.92
1949	1,841,940	153,686	8.34	81,873	4.44
1950	1,973,574	177,714	9.00	132,547	6.72
1951	2,247,711	179,073	7.97	129,121	5.74
1952	2,289,836	209,591	9.15	138,916	6.07
1953	2,357,082	236,455	10.03	141,044	5.98
1954	2,316,323	239,479	10.34	144,430	6.24
1955	2,449,880	270,830	11.05	164,615	6.72

Percentage Changes Vary By Quarters

(Per cent change over same period previous year)

Crude Imports

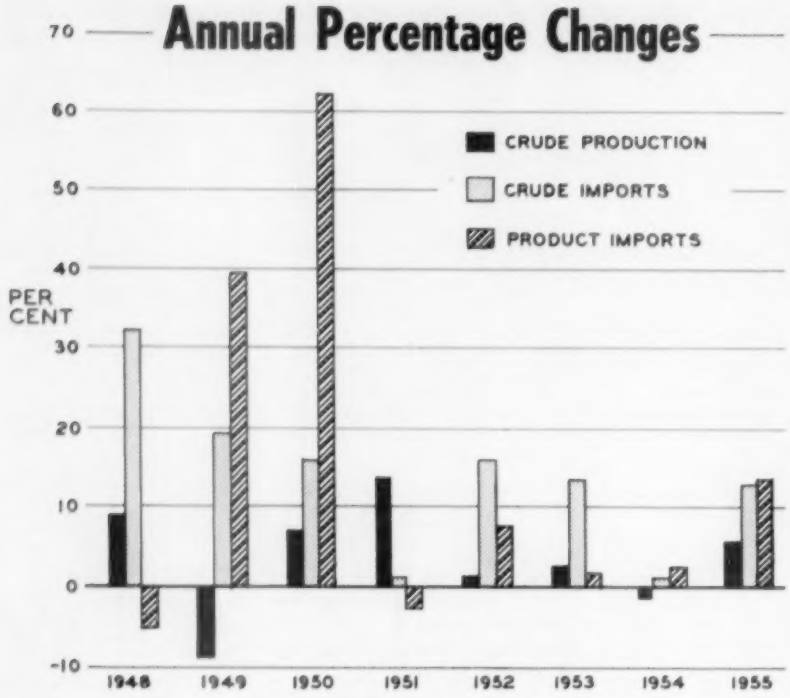
	Quarter — First	Second	Third	Fourth	Year
1948	—1.06	26.64	39.54	64.77	32.21
1949	50.00	21.65	7.63	8.28	19.26
1950	9.05	20.80	27.59	6.79	15.68
1951	5.68	9.96	4.17	—18.91	0.82
1952	2.48	4.72	17.14	47.28	16.70
1953	25.00	22.16	7.97	0.80	13.09
1954	1.77	—6.19	3.46	6.53	1.23
1955	17.91	13.99	9.17	12.11	13.11

Product Imports

1948	—1.51	—10.12	8.96	—14.12	—4.73
1949	—14.80	29.14	56.16	101.32	39.13
1950	107.78	78.97	46.49	37.58	62.05
1951	28.82	—0.29	—26.35	—10.45	—2.48
1952	—1.79	6.90	8.54	16.71	7.34
1953	5.47	—4.30	5.99	—1.36	1.58
1954	1.30	—4.78	4.59	10.60	2.59
1955	28.78	13.77	11.49	2.08	13.89

Crude Production

1948	11.69	7.26	6.32	8.97	8.49
1949	—0.45	—8.12	—12.90	—12.25	—8.59
1950	—7.65	4.01	18.29	14.85	7.15
1951	21.21	19.05	9.41	7.69	13.89
1952	5.78	—4.15	0.92	3.93	1.59
1953	3.51	9.57	4.91	—4.35	3.23
1954	—2.49	1.08	—5.94	0.62	—1.73
1955	7.09	3.54	5.85	6.66	5.77



percentages to demand, either domestic demand or total demand—and these are two different figures. Some have taken total domestic production of all liquid hydrocarbons—which is about 10 per cent higher than crude production because it includes plant production of natural-gas liquids.

Some have applied the percentages to 1954 crude production, whereas the cabinet committee recommended the 1954 ratio—thus using a moving base instead of a static historical figure.

Spokesmen for domestic producers are prone to put out figures showing that imports are increasing at a faster rate than domestic production, or faster than domestic demand. They also frequently compare total imports with last year by quarters, and show the percentage increase.

None of these bases is the one used by the cabinet committee, but some of them are presented here for purposes of comparison.

The third table and an accompanying chart show percentage increases in imports and production compared with previous periods. The table shows, for example, that during the second quarter of this year imports of crude increased 13.99 per cent and products 13.27 per cent, while domestic production increased only 3.54 per cent.

However, it just happened that imports of both crude and products were declining during the second quarter of 1954, while domestic production was in its best growth period of the year. This illustrates the distorted picture which may be drawn by using too short a period of time for comparisons.

What the Committee Said

Much of the argument over whether imports are "excessive" is due to misinterpretation or ignoring of the recommendations made by the cabinet committee.

Since this is the standard which presumably will be used by the ODM, it is important to note exactly what this report said—and what it did not say.

It said: "If in the future the imports of crude oil and residual fuel oils exceed significantly the proportions that such imported oils bore to domestic production of crude oil in 1954, appropriate action should be taken."

Here's how to apply the formula: Get final 1954 figures on crude production, crude imports, and residual imports, and then compute the percentages. This is done in the middle table, which also shows the forecast for 1955 and comparisons with previous years.

Then take these percentage figures—10.34 for crude and 6.24 for resid—and apply them to 1955 domestic crude production. This gives you the volumes of crude and of resid which can be imported this year without exceeding the committee's recommendation.

An accompanying table and a chart show how these work out, and compares them with actual imports performance during the first part of the year and anticipated performance the rest of 1955.

What was left out . . . Now note what the cabinet report did not say. It did not relate future imports to the 1954 volume—only to the 1954 ratio. So as domestic production goes up, imports can go up in volume without exceeding the recommended ratio.

It did not base its recommended level on 1954 domestic production. Instead its percentage factors must be applied to current production. This means that domestic production and imports must be compared for the same periods—not different periods.

This requires the use of preliminary statistics, estimates, and forecasts, because final figures for either production or imports are not available until some time after the close of any given period. This is rather awkward, and would present some brow-wrinkling adminstrative problems if these were legally enforceable quotas.

It did not relate imports to domestic demand or total demand—either for crude and resid separately or demand for all oils—though such a formula was urged by a good many people.

It did not refer to total imports, but treated crude and resid as separate classifications and established a different percentage figure for each.

To be precise, resid imports should be broken out from the general category of products imports. However, resid normally constitutes nearly 90 per cent of all products imports, and the industry commonly uses the statistics on all products imports as a rough measure of the rate of residual imports.

It isn't the law, but . . . The committee report did not say whether its formula should be applied by monthly, quarterly, or annual periods. There are obvious difficulties in applying it to too short a period since both production and imports may fluctuate seasonally. For instance, resid imports are always high during the winter quarters and low during the second and third quarters of each year.

The cabinet committee report was issued late last February as a policy recommendation only. It is not law. The new tariff act, signed June 21, gives the Office of Defense Mobilization authority to make studies of imports and recommend action to the President. It is generally assumed that ODM will use the committee's recommendations more or less as its yardstick in determining whether or not oil imports are excessive.

Right now the industry knows only that: Imports are higher; imports exceed the level recommended by the cabinet committee; something may or may not be done. Only Washington knows what may happen, or when.

Spraberry Ruling Near

Texas Railroad Commission pondering Phillips request for changes in gas-oil ratio, allowables for ailing field

AUSTIN, Tex.—Just what, if anything, should be done about ailing Spraberry Trend Area field in West Texas is now being pondered by the Texas Railroad Commission. Its decision should be reached soon.

Operators in the huge 400,000-acre field finished arguments here July 20 on the desirability of new field rules proposed by Phillips Petroleum Co.

These rules, first advanced by Phillips at a hearing June 3, would increase the permissible gas-oil ratio in the field from the present 2,000:1 to 4,000:1 and exempt low-capacity wells from shut-down days.

The low-capacity producers are those not capable of making their allowables and comprise an overwhelming percentage of total wells in the field. They would be exempt from shut-down days by calculating daily oil allowables, gas-oil ratios, and gas limits on a lease basis rather than on an individual well basis.

Phillips and other Spraberry operators testified during the hearings that such measures were necessary in view of rapidly dropping oil production and skyrocketing gas-oil ratios in the field *(The Oil and Gas Journal, June 13, page 126)*.

Phillips said that gas-oil ratios were averaging anywhere from 2,867:1 to 10,807:1 in various areas of the field. The field-wide average for Spraberry's roughly 2,400 wells, it said, is well above the proposed 4,000:1 limit.

If the commission enforces the statewide 2,000:1 ratio, it argued, the rule would work a severe hardship on Spraberry producers and cause waste through premature abandonment of a great many producing wells. The company said it figures 10 to 15 per cent of its more than 200 flowing wells in the field could not be produced economically and would have to be plugged. Other operators, it figures, are in similar shape.

High interest . . . The initial hearing stirred tremendous interest among all concerned with Spraberry—producers, gasoline-plant operators, and pipelines taking residue gas from the field.

It was recessed until July 20 by the commission so that results of the April-May-June gas-oil ratio survey in the field could be studied by the commission and to give other operators a chance to study and calculate effects of Phillips' proposals.

The commission also instructed Phillips at that time to calculate, using results of the April-May-June G.O.R. survey, how its proposed rules would affect monthly oil and gas production from the field.

Phillips had these figures ready when the hearing reconvened before a large group of operators in the Stephen F. Austin Hotel here last week. As the company had contended earlier, its figures showed that either of its proposed sets of rules would cut production of both oil and gas in Spraberry.

Compared to actual April production from the field, Phillips said its preferred set of rules would cut oil production 8.12 per cent to 1,660,121 bbl. monthly and casing-head gas output 14.21 per cent to 10,141,506 M.c.f. monthly based on a 15-day producing rate.

Its second set of rules would cut oil production 7.15 per cent to 1,675,149 bbl. monthly and gas production by 8.7 per cent to 10,655,417 M.c.f. monthly on the same 15-day producing rate.

The April-May-June gas-oil ratio survey, the hearing brought out, placed weighted average gas-oil ratio of wells over the entire field at 4,872:1. District 7-C portion of the Spraberry appears to be much better off than the District 8 area so far as ratios are concerned.

The weighted average ratio in the District 7-C end was 3,867:1, while in District 8 it was a soaring to 7,330:1.

Operators divided . . . As in the June hearing, Spraberry producers were widely split on the desirability of the Phillips' proposals and argument at times was heated.

For the most part, the larger companies opposed portions of Phillips' rules calling for lease oil allowables, ratios, and gas limits. A majority of the smaller operators, on the other hand, favored adoption of the rule amendments.

Humble Oil & Refining Co. and The Texas Co. opposed all provisions of the rules. Stanolind Oil & Gas Co., Shell Oil Co., and Skelly Oil Co. did not object to the 4,000:1 ratio but said they strongly opposed exempting low-capacity wells from shut-down days.

Sinclair Oil & Gas Co., British-American Oil Producing Co., Edwin Pauley, Fred Shields, Hanley Co., Southland Royalty Co., and Plymouth Oil Co. backed one or the other of the Phillips' proposals.

Opposition argument . . . Main arguments of the opposition were that adoption of rule amendments calling for lease oil allowables, ratios and gas limits would destroy correlative rights in the field.

Guy Buell of Stanolind charged that Phillips was trying to overthrow the present system of regulation which he said is geared to better wells in a field in favor of a system regulating on the basis of the poorest wells.

The Phillips rules, he said, would penalize the best wells and permit the poorer wells to produce just as much as the best ones in many cases. To order such a drastic change in statewide regulations, Buell said, the commission would have to find that the amendments would preserve correlative rights and prevent waste. The commission cannot approve these rules, he said, because they would have just the opposite effects.

Gas plants neutral . . . Gasoline-plant operators in the field appeared to be satisfied with testimony by Phillips last week that a 4,000:1 gas-oil ratio would not increase gas production. Phillips presented evidence that an enforced 4,000:1 ratio actually would cut gas production from present rates where the 2,000:1 ratio has not been enforced. During the June phase of the hearing, three of the five gasoline plants in the field testified that their plants were processing all the gas economically justified in view of Spraberry's predicted short producing life.

The only two plants in the field not operating at capacity are Phillips' Spraberry and Pembroke plants. It appeared that Phillips, in addition to being worried about perhaps having to plug some of its wells, also was deeply concerned over what an enforced 2,000:1 ratio would do to the load factor and consequent economics of its gasoline-plant operations.

What may happen . . . It is believed the Railroad Commission will not impose Spraberry allowable penalties based on the just-compiled results of the April-May-June gas-oil ratio survey until the commission makes its decision on the Phillips-proposed amendments to field rules.

Chief Engineer Arthur Barbeck assured operators at the hearing that the commission will act on the matter as soon as possible.

Consensus of operators involved in the hearing seems to be that the commission may go along with an increase in the gas-oil ratio limit for the field to 4,000:1, but isn't likely to approve lease oil allowables, gas-oil ratios, or gas limits.

The theory is such action might set a dangerous precedent.

Two companies point the way toward . . .

. . . Reforming Natural Gasoline

F. Lawrence Resen

HOUSTON.—In almost simultaneous moves, two Southwest plant operators have announced incorporation of catalytic reforming in their gas processing setups.

This extension of naphtha upgrading to natural gasoline has long been heralded. But this is the first application of modern catalytic reforming to existing natural-gasoline and gas-processing plant operations.

The two new Platformers, licensed by Universal Oil Products Co., are being installed by Texas Gas Corp. at Winnie, Tex., and Southwest Gas Producing Co., Inc., at Dubach, La. In making this move, these two companies are upgrading a low-octane fraction of their distillate production to a minimum 95 research octane number, leaded reformate.

This places them on a sure footing in today's market.

The catalytic reforming of field distillate comprising both natural gasoline and cycle product fractions is not new. Some fractions are finding their way into refineries, where they are blended with petroleum naphthas to make cat-reforming feed stocks. Others are being pooled and moved to processing plants, where they comprise the bulk of feed stock to catalytic-reforming units.

But the incorporation of catalytic reforming in gas processing and gasoline plants themselves is new, and some think the practice is going to spread.

Sign of the times . . . Field distillate, including natural gasoline and cycle product, has gradually been losing its position as a motor-fuel blend because it has been left behind in the octane race.

In order to retain this outlet, it is going to have to be upgraded by producers in the field or sold for conversion in refineries. Up to this year the economics of this additional investment in gas-processing and natural-gasoline plants has apparently been unfavorable. Otherwise such investments would have been made. But competitive pressure has a way of changing economics, and the decision of these two companies may signal a wider use of catalytic reforming in these operations.

Texas Gas operation . . . How much improvement is possible with catalytic reforming may be seen at Texas Gas. This plant is primarily a gas processing operation tied in with light refining installation, i.e., topping, reforming, etc. There pool octane number (reformate plus 200° F. end point gasoline) is increased from 86.5 to 93.5 research octane number, with 3 cc. TEL.

But it isn't just a matter of hooking a modern cat reformer onto the tail end of any processing plant. The operators point out that the type of feed stock available for such processing is important and that catalytic reforming may not be the answer for all gas processing, natural gasoline and cycling plants in the nation. However, given a field distillate from which a suitable reforming feed stock can be cut, a processing plant can manage to stay in the premium gasoline business. Both of these plants are doing just that.

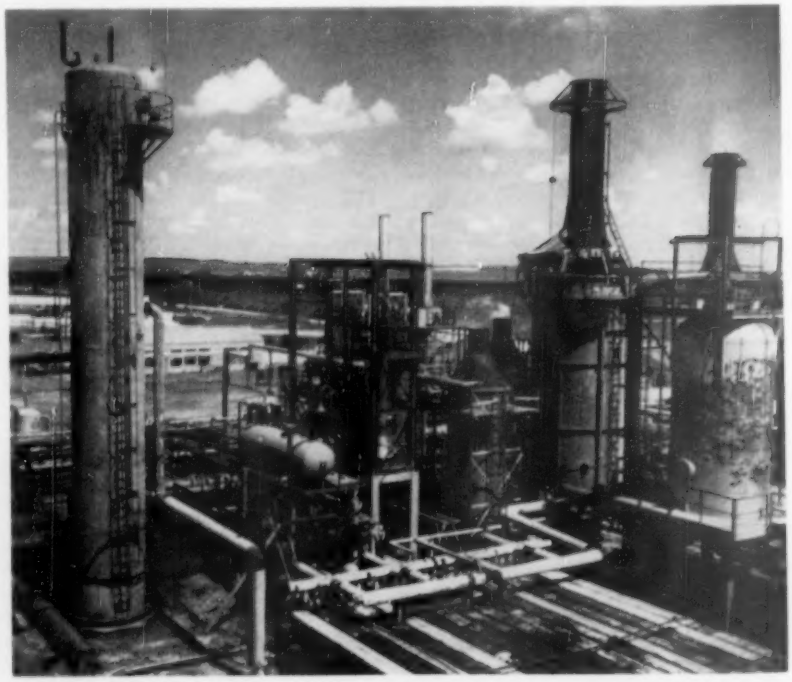
Southwest plans . . . Southwest Gas is processing production from multiple reservoirs in six nearby gas-condensate fields. Part of its processing plans calls for the addition of a feed-preparation unit which will furnish a maximum of 2,000 bbl. per day of 200-400° F. naphtha as charge stock to the Platformer. Other operating conditions are shown in the accompanying table.

Operation of the unit will be continuous but will have a designed flexibility to produce a platformate ranging from 95-98 F-1 octane number (with 3 cc. TEL), depending upon severity of contact employed. Contact severity will be governed by velocities maintained in reactor sections, which in turn will be controlled by feed rates.

A feed bypass around the Platformer will eliminate blocked operation. With this arrangement, any feed volume up to 2,000 bbl. daily can be directed to the unit and upgrading controlled to any specified level up to 98 octane.

Charge stock here contains approximately 21 per cent aromatics and, since the greater part of this occurs in the lighter ends, it is felt that higher octane levels can be obtained by excluding as much of this material as possible. Platformate will be blended with natural gasoline to make a premium-grade motor fuel of 95 octane and a regular 89 octane grade.

Plant conversion . . . A somewhat different situation exists at Texas Gas. It receives about 175 million cubic feet of gas per day into two combined plants from which it recovers about 2,550 bbl. of distillate. In addition,



CAT REFORMING is being incorporated at Texas Gas Corp.'s natural-gasoline and gas-processing plant at Winnie, Tex. It may point a trend in refining.

500 bbl. of distillate is purchased and trucked into the plant. The distillate is combined and then processed in existing units to fractionate a 195-395° F. naphtha charge to the reformer.

Interestingly, the Platformer was converted from a Cycloversion unit previously in use at the Winnie plant. This conversion was made primarily by revamping existing equipment and adding three reactors. Part of the over-all processing plan included distillate-topping units to provide feed to the Cycloversion unit. This is the same feed for the Platformer and the identical units are used to prepare it in the new process scheme.

About 1,452 bbl. of naphtha is now available for charge stock to the Platformer, under present conditions. Increased throughput at a later date and more purchases have been anticipated in building a 2,500-bbl. capacity unit.

In its operations, Texas Gas aims for a minimum of 95.5 R.O.N. (with 3 cc. TEL). On a design basis of 2,500 bbl. charge, 2,473 bbl. of reformate will be realized. This includes 8.3 liquid volume per cent makeup of n-butane to produce 10 lb. R.v.p. stock. This will then be blended with the 200 e.p. natural gasoline to make desired regular and premium grade motor fuels.

Meet competition . . . In their moves, Texas and Southwest Gas signify a determination to meet competition head-on. In so doing, they've taken a step away from the traditional role of the gas-processing and natural-gasoline plant operator.

Traditionally beset by seasonal demand fluctuations for L.P.G., the processing-plant operator may find reforming both a stabilizer and a lifesaver. It could broaden his marketing base and better make him able to withstand the seasonal ups and downs. And it could give him a product to sell in today's and tomorrow's high-octane market.

A big "IF" remains in the availability of suitable feed stock, in quantities sufficient to justify a catalytic reforming unit. But even this latter requirement is not insurmountable. As one operator pointed out, several plants in one locality could pool their limited distillate to operate one reforming unit.

What of tomorrow? . . . While it appears that processing-plant operators may adopt catalytic reforming in growing numbers, the question remains: How long can they stay competitive in a rising octane situation? Straight, single-pass reforming has its limits in yields and in antiknock quality of the final product.

Now available or soon to be introduced are two additional processing concepts which plant operators may be considering in the future.

The extraction and recycling of low-octane components in catalytic reformate has already been offered to the refining industry as a means for making 100-octane product.

These include the Rexforming process by Universal Oil Products Co., the Iso-Plus process by Houdry Process Corp., and a modification of Catforming by Atlantic Refining Co. *(The Oil and Gas Journal, March 28, page 102; April 4, page 98 and page 253; and June 13, page 135).*

From a purely processing standpoint, this technique is ideally suited to the highly paraffinic feeds found in natural gasoline and cycle product, promoting their conversion to aromatics.

None of these processes has yet been applied commercially, although it is conceded that they will come into the refining picture when the octane level demands it. The same might be said of natural gasoline and cycle product processing.

A second possibility now gaining in consideration, is the isomerization of n-pentane. This is believed to be coming, since the C_5 fraction of both petroleum and field-distillate naphthas is becoming the problem child, process-wise. Laboratory and pilot-plant work and some commercial operations indicate that the same platinum-type catalysts now used for reforming will perform well in converting low-octane n-pentane to high-octane iso-pentane. This, too, may come into the economic picture when the competitive pressure of rising octanes makes it necessary.

Plant Operating Conditions

	Texas Gas	Southwest Gas
Capacity, bpd.	2,500	2,000
Feed stock:		
Composition: (per cent)		
Pariffins	54	63
Naphthenes	36	16
Aromatics	10	21
Octane rating (F-1 clear)	45.7	48
A.P.I. gravity	55.7	54.6
Distillation: (Deg. F.)		
IBP	194	194
10 per cent	230	245
50 per cent	270	282
90 per cent	338	332
E. P.	392	396
Products:		
Gas, M.c.f./d	1,656	1,001
Butanes plus:		
Bbl./d	2,250	1,860
A.P.I. deg.	51.5	54.5
R.v.p.	5.2	7.0
F-1 clear	81.5	84.0
F1/3 cc.	95	95
Pentanes plus:		
Bbl./d	2,160	1,740
A.P.I. deg.	49.5	51.5
R.v.p.	2.2	2.6
F-1 clear	83	83.2
F-1/3 cc.	94.7	94.6

Refining Briefs

BILLINGS, Mont.—Continental Oil Co. has announced a $1,000,000 expansion for its 9,700-bbl. refinery here. The company has awarded a contract to Stearns-Roger Manufacturing Co., of Denver, to build a cat reformer and a Unifiner. Stearns-Roger expects to begin work about September 1 and have the unit ready January 1.

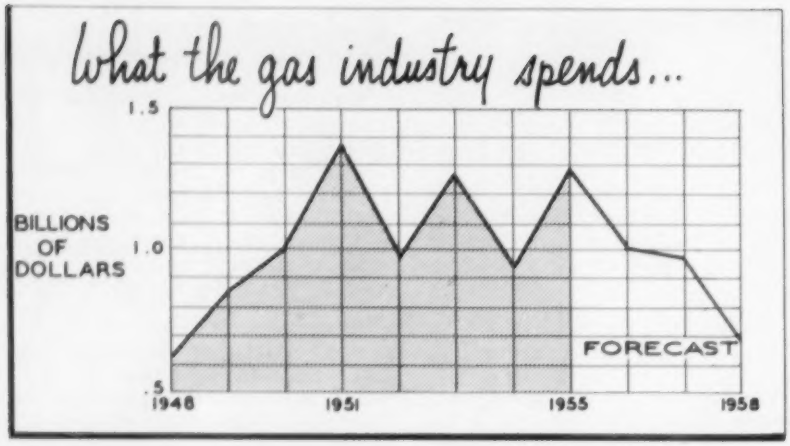
PORT ARTHUR, Tex.—Gulf has begun operating its 29,000-bbl. Platformer, the largest in the world, at its 272,000-bbl. refinery here. Fluor Corp., Ltd., Los Angeles, was the engineer-contractor on the job. The unit was designed and licensed by Universal Oil Products Co., and the process design of the fractionation facilities was done by Gulf.

CORPUS CHRISTI, Tex. — South-western Oil & Refining Co. has let contract for a 9,000-bbl. Platformer to Refinery Engineering Co., Tulsa. The unit will be installed at the company's 43,000-bbl. refinery here to upgrade a straightrun naphtha charge. Completion is scheduled by July 1, 1956.

TULSA. — A 9,000-bbl. Unifiner-Platformer unit has been placed on stream at the 35,000-bbl. West Tulsa refinery of The Texas Co. The unit was built by Refinery Engineering Co. Construction was begun in December. The combination unit will desulfurize the straightrun-naphtha feed and convert it into high-octane gasoline.

HOUSTON.—Tennessee Gas Trans-mission Co. has begun expanding two refineries it recently acquired from Bay Petroleum Corp. The company did not release details of the expansion but has announced it plans to spend $1,250,-000 on the plants at Denver and Chalmette, La. Tennessee Gas said that since its purchase of Bay its crude production has increased to nearly 20,000 bbl. daily. Tennessee acquired more than 6,000 bbl. daily in the recent purchase, which involved about $20,000,000.

BAYTOWN, Tex.—United Rubber & Chemical Co. has taken over the last of the Government's active synthetic-rubber plants. The 44,000-ton GR-S plant, located here, was sold to United for $7,838,078. Two other plants, one an alcohol butadiene plant and the other a GR-S plant remain in government ownership. The alcohol plant recently has been leased for 3 years.



Gas Boom Continues

1955 tagged by A.G.A. as second biggest year of spending in history; 1956 may dip but still will top $1 billion

NEW YORK.—The continuing boom in pipeline construction will make 1955 the second biggest year in history for new facilities in the natural-gas industry. And the outlook is for still another billion-dollar year before the pace lets up in 1957.

The industry will spend $1,284 million on expansion this year, according to a forecast just released by the American Gas Association. This total has been exceeded only in 1951, when the outlay was $1,363 million.

Conservative forecasts by the A.G.A. call for expenditures to taper off in 1957 and 1958, but the average for the 1955-58 period is still expected to exceed a billion dollars.

Even then construction may not fall off as indicated in the chart. The A.G.A. forecast always has been ultra-conservative. As the year of forecast came closer, new lines and expansion programs have required the forecasters to raise their figures substantially.

The A.G.A. said the the gas utility and pipeline industry spent $1,055 million during 1954. Natural gas accounted for more than 90 per cent of the amount and it will have an even bigger share in years to come. The total for all other types of gas last year was $109 million, and most of it went for distribution facilities. This figure is expected to drop below $100 million a year in the future.

The gas industry spent $390 million for new pipelines in 1954, and this phase of construction should soar to $720 million this year, according to A.G.A. reports. Two major pipeline projects will account for much of the total.

One is Pacific Northwest Pipeline Co.'s 1,466-mile line already under construction. It will deliver gas from the San Juan basin to major cities in Idaho, Oregon, and Washington. Cost of the line is estimated at $163 million.

Another big shot-in-the-arm for 1955 pipeline building is American Louisiana Pipe Line Co.'s 30-in. line from southern Louisiana fields to the Detroit area. The price tag on this project is $130 million.

Pipeline mileage soars . . . These lines and others that are planned will bring natural-gas pipeline mileage up to nearly 420,000 miles by the end of 1955.

The A.G.A. says the entire gas industry will spend $4,315 million on building programs during the 4-year period beginning with 1955, when the total will be $1,385 million. This compares with $4,933 million during the past 4 years. During 1955-58, natural gas will account for about $4,033 million.

The anticipated natural-gas construction is $1,133 million in 1956, $920 million in 1957, and $696 million in 1958.

The A.G.A. points out that these estimates are conservative. Most companies underestimate the costs of projected construction, especially for the more remote future.

For example, a year ago the association forecast total 1957 expenditures at $699 million. It already has raised that estimate $221 million. The 1956 estimate has been upped almost 60 per cent from a year ago. Last July the A.G.A. figured natural-gas construction this year would be $1,055 million, underestimating it by $229 million.

If this pattern is followed, expansion will continue at a terrific pace, much greater than is indicated in the chart.

Last year the gas industry used 1,800,000 tons of steel and about half of this was 16-in. pipe and larger. This tonnage figure represents a 15 per cent drop from 1953.

Here's What the Natural-Gas Industry Will Spend

1954-58 Expenditures—(In millions)

	Actual	Forecast				Total forecast
	1954	1955	1956	1957	1958	1955-58
Production and other storage	119	73	72	73	74	292
Transmission	389	720	577	402	183	1,882
Underground storage	42	74	47	32	34	187
Distribution	346	371	387	380	373	1,511
General	50	46	50	33	32	161
Total	946	1,284	1,133	920	696	4,033

"Fire Flood" Set

General Pete starting pilot plan to recover heavy oil

LOS ANGELES.—General Petroleum Corp. is starting a pilot thermal-recovery project in the South Belridge field of Kern County, the first application of the new secondary-recovery method to heavy crudes.

The experiment is expected to take 2½ to 3 years to complete and will cost about $1,000,000. Its purpose will be to find out if thermal recovery, known also as "in situ combustion" and "fire floods," is feasible from both an engineering and economic point of view and if it is a new tool for producing low-gravity crudes which are unrecoverable by any other means.

The project will be carried out in the upper portion of the Tulare oil zone at a depth of approximately 700 ft. Yielding 13°-gravity crude, the zone is similar to numerous other California producing zones which contain large quantities of heavy crudes at the end of primary production.

How it's done . . . A five-well pattern will be used. Four will be production wells 330 ft. apart. The underground fire will be started in the center well, and by regulating the amount of air

injected combustion will be expanded outward. Four observation wells also will be included in the project.

Other companies having an interest in the experiment are Continental Oil Co., Esso Research & Engineering Co., Gulf Oil Corp., Honolulu Oil Corp., Ohio Oil Co., Shell Development Co., Sunray Mid-Continent Oil Co., The Texas Co., Tide Water Associated Oil Co., and Union Oil Co. Engineers of Magnolia Petroleum Co., which conducted a similar test in southern Oklahoma in 1952, will serve as advisors.

Allowable Extended

Texas' August quota upped 27,807 bbl. for new wells

AUSTIN, Tex.—Texas' daily oil allowable for August will be 3,028,324 bbl. — virtually unchanged from July.

The Texas Railroad Commission last week ordered the 15-day producing rate continued from July. Only one major purchaser objected.

The allowable actually was increased over that in effect July 2 by 27,807 bbl. daily. But the increase was due entirely to new wells completed.

The lone dissenter among major Texas oil purchasers nominating for 15 producing days was The Texas Co., which asked for a 16-day schedule.

Fort Chadbourne field of West Texas was cut to 11 producing days on request of operators there. Humble Oil & Refining Co., acting as spokesman for operators both in and outside the Fort Chadbourne unit, said they needed a chance to watch effects of a water-injection program. They also want to stop gas flaring which has resulted from climbing gas-oil ratios.

Cosden Petroleum Corp. asked that Snyder field of Howard County again be subjected to shutdown days. Production from this field jumped from 250 to 3,000 bbl. a day recently due to an extension of field limits. Cosden, the sole purchaser, said this is more oil than it can handle.

AUGUST ALLOWABLES

District—	August	Change from July 2
1—Southwest	61,417	1,899
2—Gulf Coast	139,948	1,117
3—Gulf Coast	463,976	804
4—Southwest	240,058	854
5—East Central	50,809	646
6—Outside East Texas field	120,662	1,020
6—East Texas field	203,868	235
7-B—North Central Texas	174,956	2,116
7-C—West Central Texas	196,588	2,397
8—West Texas	986,794	9,568
9—North Texas	266,967	5,192
10—Panhandle	122,281	1,869
Total	3,028,324	27,807

Oil Imports Move Up Sharply

NEW YORK.—Both imports and exports of crude and petroleum products moved up in May. Both totals also were above May of last year.

Total imports averaged 1,140,000 bbl. daily, including 739,000 bbl. daily of crude and 401,000 bbl. daily of products. This represented an increase of 20,000 bbl. daily over the average for April and a gain of 174,000 bbl. daily over May of last year.

However, part of the big increase over last year can be credited to the very low level of imports for May 1954. The total for that month was next to the lowest for 1954.

Crude imports of 739,000 bbl. daily set two new records for the month. Imports of Canadian crude climbed slightly to reach a new record at 33,000 bbl. daily. Imports for refineries in Washington accounted for 27,400 bbl. daily of the total. The remaining 5,600 bbl. daily came to refineries in the Great Lakes area.

Imports of Kuwait crude averaged 161,500 bbl. daily to set another new record. The big month could be due to irregular scheduling since the April Kuwait average was down to 97,200 bbl. daily.

The Census Bureau reported 221,473 bbl. of crude from Syria. Since Syria has no production and since one of the importing companies in its report to the Texas Railroad Commission listed this exact amount from Iraq, the crude has been credited to Iraq in the accompanying table.

The crude total does not include 207,719 bbl. of Venezuelan crude going to Puerto Rico. This crude which was the first listed by the Census Bureau for Puerto Rico, was classified as under 25° gravity.

Exports of crude and products, excluding shipments to territories, averaged 334,000 bbl. daily for the highest average since June of last year.

IMPORTS INTO CONTINENTAL U. S.
(Thousands of barrels)

	May 1955	April 1955	May 1954
Crude—			
Mexico	487	491	289
Colombia	626	735	1,225
Venezuela	11,472	10,918	11,408
Peru	123		128
Kuwait	5,006	2,916	3,246
Saudi Arabia	2,057	2,682	2,613
Neutral Zone	237	165	217
Iraq	464	544	
Qatar	640	236	
Canada	1,023	904	138
Far East	763	1,227	1,405
Total crude	22,898	20,818	20,669
Daily average	739	694	667
Products—			
Residual fuel	11,089	11,734	8,143
Other products	1,359	1,055	1,123
Total products	12,448	12,789	9,266
Daily average	401	426	299
Total all oils	35,346	33,607	29,935
Daily average	1,140	1,120	966

EXPORTS*

	May 1955	April 1955	May 1954
Crude	1,166	1,431	1,258
Gasoline	2,339	1,709	2,318
Kerosine	297	216	157
Distillate fuel	2,107	1,217	1,906
Residual fuel	2,290	2,535	2,018
Lube oils	1,104	1,216	1,289
Other products	1,041	940	934
Total all oils	10,344	9,264	9,880
Daily average	334	309	319

*Excludes shipments to territories.

Industry Briefs

WASHINGTON. — Gasoline had its highest octane rating in history last winter, according to a Bureau of Mines report. The average octane number of premium gasoline was 93.6 by the research method and 84.5 by the motor method. Regular gasoline showed 86.2 by research method and 80.8 by the motor method. The bureau collected 4,802 samples representing the products of 117 companies.

WASHINGTON.—The Interior Department stands to take in more than $1,000,000 a year in rentals from the oil and gas leases off Louisiana and Texas it sold July 12. Officials estimate that first-year rentals will amount to $758,420 for the Louisiana acreage and $449,280 for the Texas tracts.

DENVER.—The Colorado Oil and Gas Conservation Commission will hold a second hearing on August 16 to get new ideas on how to prevent waste of oil and gas in Rangely field. The initial meeting was held July 14 after the state Supreme Court had voided a commission order requiring reinjection of dry gas in the state's largest field.

WASHINGTON.—Congress has taken final action on extension of the Interstate Oil Compact for 4 years. The Senate dropped its own provision for reports from the attorney general on whether the compact was being used to limit production or fix prices. It accepted a House provision which called for the same reports.

Ammonia Lures Pair

Continental, Cities Service buy partial interest in distributorship, plan future plant at Lake Charles

MEMPHIS.—As a first step toward getting into the synthetic ammonia business, Continental Oil Co. and Cities Service Oil Co. last week acquired a partial interest in a major ammonia distributor, Mid-South Chemical Corp. Eventually, the two oil companies plan to purchase Mid-South outright, on a 50-50 basis.

Further down the road the companies plan a 275-ton per day synthetic anhydrous ammonia plant adjacent to their refineries at Lake Charles, La. This plant is still in the engineering stage, and several decisions will have to be reached before the companies let a contract.

Byproduct hydrogen . . . The new plant will be based either on catalytic byproduct hydrogen, or hydrogen derived from natural gas. Both are available at Lake Charles, but the present engineering study concerns among other things, the advisability of using reformer hydrogen for internal product upgrading within the refineries, or for ammonia.

Cities Service Refining Corp. operates an 18,000-bbl. per day fluid Hydroformer at the Lake Charles refinery, and nearby, Continental operates a Platformer rated at 5,600 bbl. per day. Ammonia production will be handled by Petroleum Chemicals, Inc., which is another joint Continental-Cities Service operation.

The new chemical company's first active project is the 63,000-ton per year butadiene plant at Lake Charles. It was purchased from the Government for $16,000,000 earlier this year. This wartime plant was formerly operated for the Government by Cities Service Refining Corp.

Sales first . . . By first acquiring established distribution and sales facilities in advance, the two companies plan to establish an adequate outlet for their ammonia product by the time they go into production. Final decisions concerning the type of plant and the raw material may be reached within the next 2 to 3 months, after which bids will be asked.

Mid-South's President Ellis T. Woolfolk revealed that the company's operations will be expanded to include much of the Central U.S. At present, it distributes liquefied ammonia through 85 stations to markets in Alabama, Mississippi, Arkansas, Louisiana, Missouri, Kentucky, and Tennessee. The firm purchases the product from producers in that general area. Last year the company sold 20,000 tons of ammonia. Distribution is by river barge, tank car, and truck.

Union Hits in Beaver

Gas wildcat may extend trend 8 miles southwest

TULSA.—Union Oil Co. of California has announced one of the most important gas-distillate discoveries of the year for the Oklahoma Panhandle. The strike is the 1 Parker located in rank untested territory of Beaver County, 8 miles southwest of nearest production.

The well flowed 9,100 M.c.f. of gas per day with a strong spray of distillate on a Morrow sand (Pennsylvanian) drill-stem test at 7,085-7,170 ft. Bottom-hole pressure shut in was 2,120 psi. This is one of the highest bottom-hole shut-in pressures recorded in Beaver County.

The tool was open 25 minutes with gas showing to surface in 1½ minutes. Recovery was 30 ft. of distillate (59.4°) and 5 ft. mud. Initial flowing pressure was 1,365 psi. Final flow pressure was 1,815 psi.

The Union wildcat and a Colorado Oil & Gas Co. test in the eastern part of the county which found gas in the Morrow sand give new hope for another Mocane area in the county. The exploration trend in the county the past few weeks has been toward the southern and southeastern parts of the county, miles from production.

The 1 Parker also tested the Chester-Mississippian formation. This is a prolific pay in the north-central section of the county at Mocane. The Chester was entered at 7,435 ft. A drill-stem test at 7,419-85 ft. got some gas showings. Operator will test entire Chester section, going on down to the St. Genevieve expected at about 8,000 ft. The bit is now working below 7,770 ft.

Union's apparent strike is inside a large Sinclair Oil & Gas Co. acreage block. Superior Oil Co. and Oklahoma Natural Gas Co. also have acreage in the immediate area of the Union well.

Gilsonite Plant Site Chosen

SALT LAKE CITY.—American Gilsonite Co. has selected a site for its new coke and gasoline plant.

It will be erected near Fruita, in western Colorado, where the firm has acquired more than 800 acres of land, President E. F. Goodner announced last week.

The refining plant is part of a $10,000,000 project which also includes plans for expansion of gilsonite operations at Bonanza, Utah, and laying of an 8-in. connecting pipeline to supply the raw materials in a slurry to the new plant *(The Oil and Gas Journal, July 4, page 90)*. At the terminal it will be dried for use as a feed stock to the refinery units. The refinery will have an initial capacity of 600-700 tons daily.

Products of the refinery will be a gasoline of "excellent quality and with octane ratings equivalent to modern aviation fuels," and a high-grade electrode coke. The coke will be sold for use in the manufacture of aluminum and in the specialty carbon field. The plant will employ about 150 workers.

Plant to Strip Adena Gas

FORT MORGAN, Colo.—A new gasoline plant is scheduled to go on stream August 1 in Adena field 12 miles south of here in Morgan County. The plant, to be operated by Pure Oil Co. for 97 per cent of the field operators, will take 10,000,000 cu. ft. of gas daily from 185 Adena wells.

This plant and a second operated by Continental Oil Co. will virtually eliminate the flaring of gas from 325 oil wells producing in northeastern Colorado.

The new facility is a "dry" low-temperature unit which will use water only for jacket and lube-oil cooling. Tests indicate 1 to 1½ gal. of liquid will be produced per 1,000 cu. ft. of gas. Remaining gas will be transported to Denver, Fort Morgan, and Brush through the 61.8-mile pipeline system placed in operation last month by Natural Gas Producers, Inc.

Merger Discussed

Lion Oil-Monsanto deal nearing final decision

EL DORADO, Ark.—Merger negotiations between Lion Oil Co. and Monsanto Chemical Co. were nearing completion last week. Lion Oil officials here said a decision one way or the other could be expected in a matter of days.

It was not definite whether Monsanto, a St. Louis firm with assets of $375 million, proposed to acquire Lion's chemical production facilities or the entire company, whose holding are valued at $147 million.

Col. T. H. Barton, Lion chairman, said late last week there was nothing final on the deal.

"We should reach a decision before the week is over," Barton said.

Lion is an integrated oil company which produced 8,333,034 bbl. of crude oil last year and 14.5 billion cubic feet of natural gas. It has a refining capacity of 25,000-bbl. daily at El Dorado and owns undeveloped leases in 15 states.

Monsanto, a major manufacturer of chemicals, is particularly attracted by Lion's anhydrous ammonia facilities at El Dorado and Luling, La. The plants have a combined capacity of about 265,000 tons of nitrogen annually. Lion also claims the nation's biggest ammonia storage facilities here with a capacity of 15,000 tons of ammonia and 23,000 tons of ammonium nitrate solution.

Monsanto engineers have been surveying the plants while Lion studied a possible stock transfer deal.

Monsanto is a stranger to oil production but has two petrochemical plants at Texas City, Tex. One is a brand-new polyethylene unit with a capacity of 66,000,000 lb. per year.

Nebraska Gets Conservation

LINCOLN, Neb. — The Nebraska state geologist has been given authority to establish and enforce "reasonable" oil and gas conservation rules.

Nebraska has no state conservation law, but Atty. Gen. Homer Hamilton ruled that State Geologist E. C. Reed has authority to limit oil or gas drilling to one well on each 10 acres or more and to limit proximity of wells to property lines.

"Any decision by him which is reasonable and which promotes conservation of natural resources is within the authority granted by the legislature," Hamilton stated in a written opinon asked by Reed.

Oil Country Skyscraper

Framework for the 19-story Price Tower dominates the scenery for miles around Bartlesville, Okla. The modernistic structure was designed by architect Frank Lloyd Wright for the H. C. Price Co., pipeline construction firm. It will be completed this fall and will provide both office and apartment space.

Consortium Data Secret

WASHINGTON. — D e partment of Justice reports to the White House on the consortium which brought Iranian oil back into world markets have been made available to the House judiciary committee. Secretary of State Dulles, however, refused to furnish the committee memoranda and letters dealing with detailed arrangements. He said the Government did not promise to keep them secret, but foreign governments objected to the release of information which could be "used by irresponsible elements contrary to the interests of the United States and its allies."

Letters from Atty. Gen. Herbert Brownell, Jr., to President Eisenhower during negotiation of the Iranian arrangement drew a sharp line between the consortium and the international arrangements of American oil companies which are under fire in the "cartel" suit pending in New York.

The Iranian agreement, Brownell said, would not constitute a violation of the antitrust laws nor create a violation of those laws "not already existing."

Rubber-Research Lab Opened

TORRANCE, Calif.—A rubber-manufacturing research laboratory has been established here by Shell Chemical Corp.

New studies in the field were prompted by Shell's entry into the synthetic-rubber field by the purchase of three government installations earlier this year for $30,000,000.

The installations include the 48,000-short ton butadiene plant here; the 89,000-long ton copolymer (GR-S) rubber plant at Los Angeles; and the 62,500-short ton styrene plant at Los Angeles.

The new research center will conduct studies on synthetic rubber, its chemical components butadiene and styrene, and allied materials.

Gas Imports Hit Snag

Disagreement over site of delivery marks FPC hearing into Pacific Northwest's request to bring Canadian gas to U. S.

WASHINGTON. — Proposals to import Canadian gas into the United States for use in the Pacific Northwest and California have run into a snag in hearings before the Federal Power Commission.

Firms involved in the complicated deal argued over where they would take delivery of the gas they have agreed to buy. Spokesmen for the California oil industry added to the confusion by attacking the entire import scheme.

The disagreements were aired when an FPC examiner opened hearings into Pacific Northwest Pipeline Co.'s application to import 300 M.M.c.f. of gas daily from Canada. It would purchase from Westcoast Transmission Co., Ltd.

Others involved in the hearing were:

. . . **El Paso Natural Gas Co.,** which would buy 250 M.M.c.f. of gas daily from Pacific Northwest. This would be either the Canadian gas or supplies from Pacific Northwest reserves in the San Juan basin of New Mexico and Colorado. It offered to take delivery either in Oregon, Idaho, or the San Juaa.

. . . **Pacific Gas & Electric Co.,** which would take a similar amount of gas from El Paso Natural for distribution in California.

. . . **Colorado Interstate Gas Co.,** which has agreed to take 250 M.M.c.f. of gas per day from Pacific Northwest at a takeoff near Mountain Home, Idaho, for distribution to its Colorado markets.

At opening of the hearing, Pacific Gas & Electric reported it objected to taking delivery of Canadian gas from El Paso Natural near Reno, Nev., or Klamath Falls, Ore. The firm said it would take delivery only at Topock, Ariz., of gas from El Paso's sources in the San Juan basin.

Counter moves . . . Pacific Northwest countered this turn of events by preparing an amended application. It proposed to sell no gas to El Paso Natural but use the Canadian gas for its markets in Washington, Oregon, and Idaho.

El Paso Natural also reportedly was busy working up an alternate plan to offer delivery of gas to Pacific Gas & Electric through a new pipeline to be built to the San Francisco area.

Meanwhile, Colorado Interstate asked for permission to intervene in the hearing, claiming developments have posed a threat to completion of its pipeline from Rock Springs, Wyo., to Denver.

Colorado Interstate reported if the FPC upheld Pacific Gas & Electric's objection to taking the gas at any point other than Topock, the volume of gas to be transported over Pacific Northwest's new line from the San Juan to Washington would be reduced. This would increase the price of gas to be purchased by Colorado Interstate at Rock Springs. The price rise "would jeopardize the economic feasibility of the facilities," it said.

Pacific Northwest already has begun work on its mammoth pipeline and construction of the first link of Colorado Interstate's tie-in line also has begun.

Oil men oppose . . . The gas import scheme drew fire from another quarter. The Oil Producers Agency of California asked permission to take part in the proceedings.

The California producers told the commission the gas coming in from Canada would be sold in its area in competition with their fuel oils. They declared the gas imports would "impair the market for crude oil . . . thereby causing serious and irreplaceable financial loss."

The California oil men claimed that fuel needs of the area do not warrant building the new pipelines. They declared the needs can be met by natural gas and fuel oil now available.

Huge reserves . . . On the matter of supply, Westcoast Transmission Co. witnesses assured the commission that reserves in the Peace River gas fields of Canada would be adequate to support deliveries to Pacific Northwest.

Ralph E. Davis, Houston geologist, testified he believed only about 25 per cent of the available gas had been discovered. He said Peace River appeared to be one of the major natural gas regions. It is not as large as the combined Hugoton-Panhandle field nor can it be classed with the Gulf Coast, he said. David estimated its reserves were larger, however, than the San Juan basin.

Irked by red tape, Hoover finds . . .

. . . FPC Paper Work Wasting Millions

WASHINGTON.—Demands of federal agencies for reports from business are costing the Government and industry hundreds of millions of dollars in unnecessary expense each year.

The Hoover Commission on Government Organization made this finding last week and explained: Dropping unnecessary or duplicating reports, simplifying others and less insistence on business firms keeping long-term records would save time and money. It also would not deprive the Government of any essential data.

The commission pin pointed its criticisms too. The Federal Power Commission, it said, is a serious offender. If the FPC accepted the findings of its own people favoring elimination of many of the "elaborate, tentative" applications for certificates for small new projects $1,750,000 would be saved annually by the public utility companies and half as much again by the Government. Another $1,850,000 could be saved by simplification of gas and electric filings.

One company said it fills its plane with several tons of documents and exhibits in each rate case. Company executives fly to Washington for the hearings in commercial airliners.

"Normally one or more FPC representatives then visit the utility," the Hoover report continued. "Some measure of how lengthy a process this is, is the fact that the government man commonly buys or rents a house in the locality, checks on schools for his children, etc. There he audits the company's books to see if they support the facts in the reports. In practice he seldom agrees with costs claimed by the companies. His suggestion, therefore, causes the company to revise the voluminous data originally compiled."

Record Bonus Paid

NEW ORLEANS. — Richardson & Bass, which recently set a new Louisiana depth record at a wildcat in Plaquemines Parish, has paid a record bonus for a lease on another tract in the southern part of the state.

The Fort Worth operators paid the Acadia Parish School Board a bonus of $205,777 for a 657.11-acre lease in Section 16 south of Rayne, La. The 3-year lease also provides for a rental of $102,888.50. The bonus was said to be the highest ever received by the board.

The acreage is about 160 miles northwest of the deep Plaquemines Parish test, fourth deepest well in the country and the deepest ever drilled in Louisiana *(The Oil and Gas Journal, July 4, page 67).*

Majors Like Osage

Recent successes set off richest sale in 22 years

PAWHUSKA, Okla.—Major oil companies are invading the Osage Indian country — long the happy hunting grounds of the small independent operator

Bids from the big companies, hot after new production in the shallow-well area, were responsible for making last week's Osage tribal lease auction the most profitable in 22 years.

Oil men paid a total of $2,390,900 in bonuses for 388 oil tracts on tribal lands. This was the largest sale since March 21, 1933, when bonuses totaled $3,900,000. The money will be divided among 2,229 headright holders of the tribe.

Large companies actively bidding at the sale included Phillips Petroleum Co., Continental Oil Co., Carter Oil Co., Kewanee Oil Co., Service Drilling Co., Sunray Mid-Continent Oil Co., Sinclair Oil & Gas Co., and Amerada Petroleum Corp.

Big buyer was Phillips, which acquired leases on 43 tracts on the east side of the Osage nation. Phillips also paid the largest bonus of the sale for an east side tract—$87,000—and paid $20,000 or more for six other leases in that area. Kewanee paid the top bonus of $39,000 for a west side lease. Five other leases in this area commanded bonuses of $20,000 or more.

Indian agency officials attributed much of the heavy bidding to recent successes in hitting Mississippi chat production in the Osage country. Top bids went for tracts either near or in between known production where some 2,000 ft. wells have flowed at the rate of 40 bbl. of oil per hour.

New Dow Plant on Stream

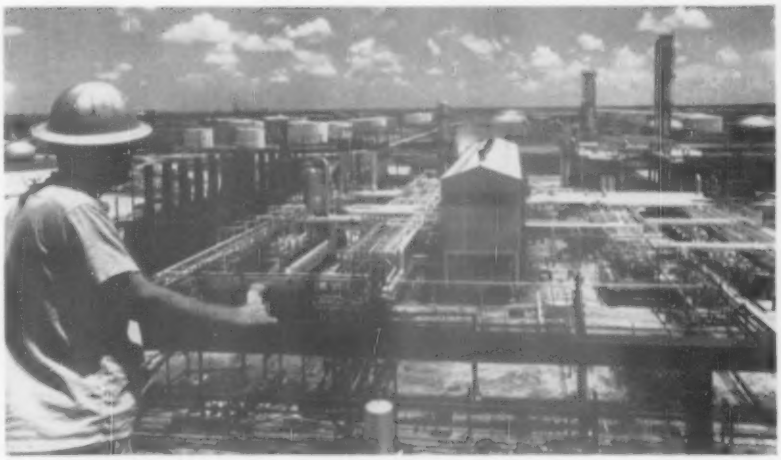
FREEPORT, Tex.—Dow Chemical Co. has joined the polyethylene parade on the Gulf Coast.

The company announced that commercial production of polyethylene has started at its new $18 million plant here, the first such unit to be built by Dow Chemical.

The plant was started in May 1954 and is scheduled to be completed by the end of the month. Full production will be achieved this winter.

First carload of polyethylene molding granules leaving the plant was shipped to Loma Plastics, Fort Worth, earlier this month.

Dow's plant uses a process licensed by Imperial Chemical Industries, Ltd., with refinements developed by its own engineers.



Gulf Moves to Top in Ethylene

PORT ARTHUR.—Start of production at the second big ethylene unit of Gulf Oil Corp.'s Port Arthur refinery moves the company into top spot among the nation's manufacturers of this petrochemical.

The plant, designed to produce more than 220,000,000 lb. of ethylene per year, is the largest of its type in the world. It more than doubles Gulf's production of ethylene and adds about 10 per cent to the nation's ethylene-production capacity.

Gulf claims the new plant will make the company the largest ethylene manufacturer in the United States.

All major construction work at the plant was completed in time for production to start July 15. Cost of the plant was not disclosed. The unit designed differs from most refineries in that no tall towers are included. The "ranch-style," spread-out plan makes the unit more accessible for maintenance crews.

The new unit processes cracked refinery gas and propane produced at Gulf's refinery.

Gulf's first ethylene plant at the Port Arthur refinery started operation in March 1953. At that time it was the largest such plant in the world.

Oil Search Due in Northern Alaska

WASHINGTON.—Interior - Department plans to open more than 20,000,000 acres of northern Alaska to oil development may be approved by Congress before the end of the session.

No legislation is necessary to revoke Public Lands Order No. 82, issued by President Roosevelt in January 1943. The order reserved the area for the Government in the event oil or gas was found in Naval Petroleum Reserve No. 4.

Interior officials, however, are anxious to have the House and Senate interior committees approve their plans. These were submitted to the lawmakers in June *(The Oil and Gas Journal, June 13, page 140).*

The Senate committee has heard Interior, Navy, and Air Force officials. Orme Lewis, assistant secretary of the interior, explained there is no longer any need for the reservation. The Navy has dropped its exploration program in the naval reserve without significant discoveries of oil. One good gas field (Gubik) was found, but a proposed pipeline to carry the gas to Fairbanks cannot be built until the land is released.

Alaska's delegate in Congress, E. L. Bartlett, also urged revocation of the land order.

Pacific Tidelands Offered

SACRAMENTO. — The California State Lands Commission has issued a request for bids on three tidelands parcels, totaling 3,282 acres, off Huntington Beach and Newport Beach.

The bids were asked immediately due to reported drainage from state land by wells of Monterey Oil Co. in Newport Beach city-owned tidelands and by town-lot wells in the southeast end of Huntington Beach field.

Four oil companies urged the commission to delay the leasing until a new tidelands law takes effect September 8. They were turned down when the commission ruled the drainage situation was acute. Protestants were Union Oil Co., Superior Oil Co., Western Gulf Oil Co., and Signal Oil & Gas Co.

FRONT SIDEWALK was the only spot open on a grocery-store lot. So the owners drilled there and brought in a producing well. It is one of 325 wells sunk on Corsicana town lots since mid-December last year.

TINY ROTARIES like this one owned by Ware Drilling, Ltd., work day and night on Corsicana town lots.

Back-yard drilling runs wild as . . .

. . . Oldest Texas Field Booms Again

Robert J. Enright

CORSICANA, Tex.—Corsicana Shallow field, the graybeard of all Texas oil fields, is staging a spectacular comeback.

Actually, you might call it a comeback on top of a comeback.

Production first surged phenomenally from water flooding in the 61-year-old East Texas field following a successful pilot flood launched in January 1949.

It has taken another big bound upward in recent months with the wide-scale application of fracture treatment.

Corsicana Shallow's oil output in January 1949 was 9,302 bbl. from 548 stripper wells—most of them very near abandonment. Last month production came to 142,000 bbl. from roughly 1,900 wells.

It is history now that Texas' first oil discovery was made in this field in 1894. Corsicana city fathers drilled a well inside the city limits searching for a new water supply and found oil instead at about 1,027 ft. in the Wolfe City sands.

The subsequently defined oil pool stretches about 5 miles from north to south and averages about 2 miles wide. The eastern half of the city of Corsicana overlies about 1,000 acres of the Wolfe City pay on the southwest side of the field.

Town-lot play frantic . . . Water flooding isn't practical, is virtually impossible in fact, in a community where property is owned in tiny pieces. Consequently there was only a handful of wells, these producing by the thimbleful, in the city portion of the field until about 1½ years ago.

Most of the original wells were abandoned between 1910 and 1920 and their location since forgotten. Last year, J. A. Jenkins, a local oil operator, drilled a well to about 1,100 ft. in the Wolfe City on the Frank Freedman place on East Fourth Avenue.

After fracturing, the well came in pumping about 21 bbl. a day and is still producing about 12 bbl. daily.

The play started slowly. Only a dozen or so wells were drilled up until December last year. Then things broke loose in a big way.

At last count July 15, 325 holes had been sunk on the town lots and fractured in the 7 months since mid-December. Wells are being drilled wherever a rig can squeeze in—in back yards, front yards, barn lots, junk yards, and on sidewalks. There is no regard for spacing. Some wells are drilled within 20 ft. of another, some on strips no larger than 25 by 50 ft.

Leases for town lots, which started selling for about $25, now are worth up to $1,000 or more plus an overriding interest in some cases.

The average well is coming in at about 30 bbl. a day. The year-old producers now are down to somewhere between 15 and 20 bbl.

Total production from the town lots, virtually nil a year ago, has rocketed to 37,000 bbl. in June and is still climbing. It will go higher before tapering off. Drilling activity is feverish, and estimates are that at least 200 more wells will be drilled by the end of the year.

This would jump the total to an astounding 525 or so for the year.

There are 10 to 12 small rotaries active on the town lots now. The number reached 20 for a short time in April.

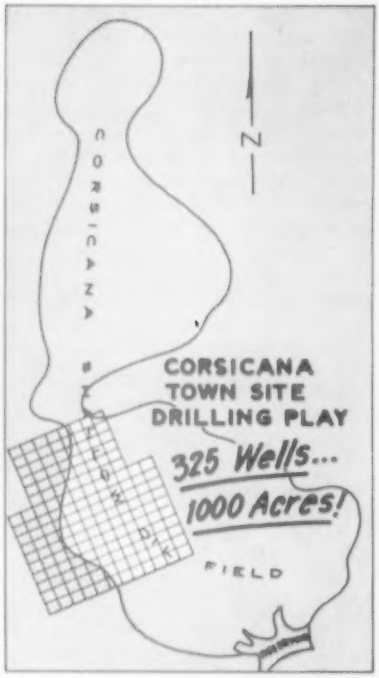
Little fellows' picnic . . . The town-lot boom in Corsicana Shallow is peculiar in that it has attracted few "foreigners." Most of the drilling and the producing is done by local concerns. Also, many drilling and producing techniques have been developed locally and much equipment is designed and fabricated in local machine and blacksmith shops. There is no oil-equipment supply store in this town of 20,000—what equipment is available is handled by established businesses as a sideline.

Biggest operator in town lots is B. M. (Mac) McCrary, a small Corsicana independent, who now has 21 producing wells scattered over the eastern part of the town.

Shallow depth of the wells and slim-hole drilling techniques have made the Wolfe City sand producers cheap enough to stir up the oil fever in many a small Corsicana merchant.

One of those who caught the fever was C. S. McClanahan, who operates a service station on the corner of North Seventh and East Fifth streets.

FRONT-YARD OILER has been prettied up with a picket fence—from royalty money no doubt. This is a common sight in Corsicana. One property owner insisted that his well be drilled in the front yard to avoid ruining his garden.



McClanahan owned his own lot and had a little spare space behind his station. In April he scraped up $6,500 and sank a well.

The $6,500 covered drilling, fracturing, and putting it on the pump. The well came in producing about 35 bbl. a day and it will pay out all costs this month.

Down the street, Watkins & McNabb, partners in a small grocery store, also got the bug. The only trouble was the grocery store occupied the entire lot except for a strip of sidewalk along the street in front of the store.

So the partners set up a rig on the sidewalk, punched down a hole, and completed a well which will supplement the grocery income nicely. This well also cost about $6,500 complete.

The $6,500 is a representative figure, though cost of drilling and putting a well on production may run as low as $5,000 and as high as $7,500.

The drilling itself costs only $1,300 to $1,400 per well. Rates are on a straight footage basis ranging from $1.00 to $1.25 per foot with tiny Mayhew or Failing rotaries rated at about 2,000 ft.

This meager fee would make most drilling contractors wince, but the local boys are doing it and making money.

The operator lays out the rest of the $6,500 for the typical little 1½ to 2-hp. pump (mostly Jensen units), casing and tubing, two 100-bbl. production tanks, the fracturing job, and miscellaneous items like cement.

"Leases" generally are electrified and the pumping cycle is controlled with time clocks. The 38°-gravity oil, priced at $2.85 a barrel, enters the old Magnolia Pipeline Co. gathering system now owned and operated by Coffield & Guthrie and is eventually piped through Magnolia's main crude system to Beaumont.

Drilling and fracturing . . . All the town-lot wells are slim-holed. Holes are drilled for the most part using 6¾-in. or 5½-in. drag bits and 2⅜-in. drill pipe. Bit size depends on the "casing" used for the oil string—whether 4-in. line pipe or 2½-in. regular or upset tubing.

If 4-in. line pipe is used for the oil string, 2½-in. tubing is used along with ⅝-in. sucker rods. If the oil string is 2½-in. tubing, 1-in. pipe serves as both tubing and sucker rods.

The oil string is the only pipe run. Absence of shallow water sands permit doing away with surface pipe. Drilling generally is halted a few feet into the pay, which averages from 30 to 40 ft. thick. The oil string is then run to total depth.

Drilling fluid is fresh water hauled in by tank trucks. Contractors also haul salt water from the deeper Woodbine formation for drilling out cement and washing the hole. Drilling-in instrument is a tiny 2¼-in. or 2½-in. blade bit—a brainchild of an ingenious Corsicana welder.

Though the town-lot wells are shallow and small, there's nothing small about the fracture treatments that are making them commercial producers.

The average job requires about 15,000 lb. of sand and 10,000 gal. of fluid. Frac jobs have been bigger, however, ranging up to 30,000 lb. of sand and 15,000 gal. of carrier fluid.

Natural production of about a barrel or two generally is hiked to about 25 to 30 bbl. daily. Without fracturing, of course, there would have been no boom.

Contracting booming . . . With nearly everybody in Corsicana clamoring to become an oil producer, local drilling contractors have been hard put to meet the demand.

About 2 years ago, Frank Ware, a royalty and lease dealer in Corsicana, decided to get into the drilling business. Ware found a partner, bought a portable Mayhew 1,000 rotary rated at 2,000 ft, and started looking for business. It came a little slow at first.

Then, 1½ years ago, Ware Drilling, Ltd., drilled the first town-lot producer for J. A. Jenkins. Since last December, Ware has been swamped, even after leasing another rig.

Since the first of this year, he has drilled 80 wells on the town lots—a total of about 90,000 ft. of hole.

It takes him only about 12 hours of actual drilling time to put down a hole if nothing goes wrong. A day and a half from the time he moves his completely mobile outfit in, he is ready to move out and make room for the service crew.

Ware's best time to date is 9 wells completed in 6 days with his two rigs.

He runs his rigs 24 hours a day (the only contractor in the play who does) and averages 3 or 4 hours of sleep a night. When he isn't at the rig site, he's generally trying to straigthen out his waiting list of impatient Corsicanans who want to be oil producers.

Ware told the Journal last week: "I never thought I'd see it like this! I used to have to get out and hustle business!"

Payout prospects . . . In the case of McClanahan, the service station operator,

and a good many others, the town-lot wells are paying out in as little as 3 months. These wells will bring a neat profit.

Payout prospects are pretty dim in a great many other cases. Generally the earlier wells will come out in good shape while many of the more recent projects will lose money—some think perhaps $1,000 per well or thereabouts.

Fracture patterns between wells often are interconnecting and this leads to some amusing situations for the observer, if not for the well owners. One operator completed a well for 35 bbl. a day in the back yard of a residence. A couple of months later, another operator drilled a well about 100 ft. away in a neighbor's yard across the street. When the second well was fractured sand shot up 200 ft. in the air out of the first.

The well was completely sanded up, but was finally cleaned out and put back on production. Each well now is producing about 18 bbl. a day. When production is suspended in either for any reason, the other's output immediately rises to 30 bbl. a day.

Not all producing . . . So far only 121 of the 340-odd wells completed are actually producing the 37,350 bbl. monthly from the field.

The remainder for the most part are shut in waiting on allowables from the Texas Railroad Commission.

The commission, too, has been snowed under—not only from the avalanche of potential forms and allowable applications from the town lots but also from applications for exceptions to the spacing rule.

Why does the commission permit such close spacing? The rule states that no well can be drilled nearer than 933 ft. from another well producing from the same pay on the same lease or nearer than 330 ft. from a lease or property line. If this were enforced, there would be few wells drilled in the town lots.

But a clause in the rule provides that a special spacing permit may be granted for much closer drilling where necessary to prevent waste or confiscation. In Corsicana Shallow, it's necessary.

End in sight . . . However, you can squeeze only so many wells into a thousand acres. And the end of the present fabulous Corsicana town-lot play is not far away.

At the current drilling pace of almost 50 wells a month, the boom should fizzle out about the end of the year.

In the meantime, if you have $6,500 and want to be an oil man, you might try Corsicana.

WATCHING WASHINGTON

Bertram F. Linz

WOC's May Become Extinct

The Government may find it hard to get top industry men to work for it—for free or for money—if Congress keeps sniping at them.

There has been considerable criticism in Congress of the men who served during and after the Korean war without government pay (WOC's). One WOC, not an oil man, is under investigation and there are hints of a possible thorough probe of the WOC set-up on which the Interior and Commerce departments depended heavily during the emergency.

Even the Justice Department is showing signs of having caught the suspicion voiced in Congress. It is making its own investigation of WOC's. Officials have tried to minimize the probe by saying it is merely a side-bar to the study of voluntary industry agreements which they make periodically.

To the men who dropped their own affairs to give unselfish service to the Government in its time of need, the idea of a headline-hunting probe is anything but pleasant. It could make industry leaders think twice before coming to Washington for anything less than an all-out war.

Pipeline Battles Still On

Pipeline transportation to both sides of the nation may figure in the news this week.

Rep. Edward Hebert's armed services subcommittee is expected to wind up its hearings on the adequacy of West Coast oil supplies. But L. M. Glasco of Dallas, whose efforts to get a certificate of essentiality for a crude line from West Texas to California, probably can't break down the wall of opposition built earlier this month at hearings in Los Angeles and Washington.

Looking at the other side of the country, Defense Mobilizer Arthur S. Flemming may reach a decision on the long-proposed products line to the East Coast.

Texas Eastern Transmission Corp. appears to have the edge on the American Pipe Line Corp., which has plans for a line from the Gulf Coast to New Jersey. Texas Eastern already has Federal Power Commission permission to reconvert the Little Big Inch gas line back to products service. It has offered to install standby pumps which would increase its capacity from 235,000 to 375,000 bbl. daily of products and to fix the Big Inch up for a quick emergency switch from natural gas to 425,000 bbl. daily of oil.

American Pipe Line has a certificate of necessity, which would let it take quick write-off on part of its investment. But it wants a certificate of essentiality under which the Government would back $70,000,000 of the money it must borrow for building.

Texas Eastern also wants government support for its investment in standby equipment on its two lines. There is no need for two pipeline system, and the choice appears to lay with the proposal that would call for the least government help.

Who's Calling Signals?

A group of congressmen is trying to find out who really runs the federal regulatory agencies.

There are quite a few of them, some dealing one way or another with the oil industry. The Federal Power Commission, Federal Trade Commission, and Interstate Commerce Commission are in this group.

These agencies were set up to be independent of the executive branch of the Government and responsible directly to Congress. Recently there have been charges that the administration has taken them over.

A House small-business subcommittee is going to find out whether there's anything to these charges. Under the chairmanship of Rep. Joe L. Evins of Tennessee, it will investigate several agencies, starting with the Federal Trade Commission.

The FTC was reorganized under the present administration. The new plan made the chairman responsible to the President, rather than to Congress. The chairman now serves at the pleasure of the President and has complete control and direction of the FTC staff.

"If it proves to be true, as we frequently hear, that these supposedly independent commissions have become political puppets on telephone wires leading from the White House or from a political committee, then it is time we made the facts known," Evins said. "Business will then at least know where to go to plead its cause."

Deep Waters Show Oil

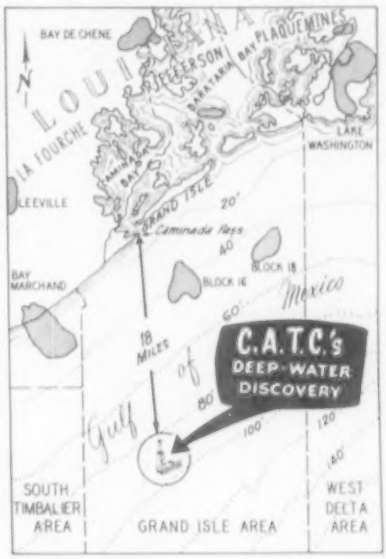
C.A.T.C. hits promising oil-gas sands at wildcat drilling in 97 ft. of water in Grand Isle area off Louisiana shore

NEW ORLEANS.—A successful oil producer apparently has been found in the deepest waters ever challenged by an offshore rig.

The C.A.T.C. group, a four-company combine for which Continental Oil Co. is operator, reported 119 ft. of commercial oil shows and 46 ft. of commercial gas shows in its first test in the Grand Isle area off Louisiana.

The well is State 953 Unit No. A-1, in Block 47. It is about 18 miles south of Grand Isle and 12 miles from nearest production. Located under 97 ft. of water in the Gulf of Mexico, the apparent discovery is being drilled in the deepest water ever encountered in offshore operations.

Reports from the deep-water test were closely guarded by the C.A.T.C. group until after the federal Government's big auction of offshore leases here July 12. Encouraging shows in the test off Grand Isle apparently had more than a little effect on bidding by the four companies in the latest lease sale, however.



Lease block held . . . The deep-water pioneers submitted high bids totaling more than $27,500,000 for nine offshore tracts offered for leasing. The tracts cover more than 29,000 acres off the coast of Louisiana, and most of them are in water ranging from 60 to 100 ft. in depth.

Partners in C.A.T.C., besides Continental, include Atlantic Refining Co., Tide Water Associated Oil Co., and Cities Service Production Co.

In the Government's latest auction, these companies submitted the only bid for another tract in the Grand Isle area. They offered a $100,217.17 bonus for Block 38, covering 4,539.89 acres *(The Oil and Gas Journal, July 18, page 62)*. This tract is about 4 miles northwest of the prospective deep-water discovery, but it is in much shallower water.

The C.A.T.C. group holds leases on more than 50,000 acres of submerged land in the Grand Isle area. Development of the leases is subject to a unitization plan, the first such agreement approved by the Interior Department for operations on the outer Continental Shelf.

Reports from C.A.T.C.'s promising wildcat still are sketchy. A Continental spokesman said the well found oil and gas shows in eight Miocene sands at various intervals between 9,845 and 14,021 ft. He said none of the intervals has been tested.

Nearest production is from Humble Oil & Refining Co.'s Block 16 field, almost directly north of the C.A.T.C. well.

Plans call for drilling to 15,000 ft. before production tests are made at the new wildcat. Late last week the well had reached 14,400 ft., and drilling was proceeding in sandy shale and lime.

The test is being drilled from a $1,500,000 platform designed by J. Ray McDermott & Co., Inc. Nine wells can be drilled from the platform without moving it.

Continental, operating individually, also has a new oil discovery in the West Delta area off Louisiana about 35 miles east of the C.A.T.C. group wildcat. It is the 1 State Lease 2551 in Block 56 off Plaquemines Parish. The well was drilled to 14,500 ft., casing set to 10,962 ft., and completed through perforations at 10,857 to 10,862 ft.

On 10/64-in. choke, the test made 267 bbl. of 36.1°-gravity oil with flowing pressure on tubing 2,050 lb., shut-in tubing pressure 3,050 lb. Gas-oil ratio was 1,248 to 1.

The well is 3,200 ft. southeast of the West Delta area discovery well.

Other high bidders . . . Although the C.A.T.C. group's combined high bids were the greatest in the federal lease sale, several individual firms made bigger investments on a per-company basis.

High bids submitted by the California Co. were the highest, totaling more than $16,800,000. Shell Oil Co. followed with high bids amounting to more than $14,000,000. Superior Oil Co. submitted high bids of more than $8,000,000, and Kerr-McGee Oil Industries, Inc., offered top bonuses totaling $7,600,000.

Retabulation of bids indicated the Government may get a bigger chunk of cash than had been expected for the oil and gas leases.

S. M. Groom, Jr., manager of the Interior Department's outer Continental Shelf office here, said apparent high bids totaled $100,091,262.93 for leases off Louisiana and $8,437,461.60 for leases off Texas. The Interior Department announced earlier that the total for both areas was a little more than $106,907,000.

Gas Bill Vote Near

House may vote this week; Senate plans are unknown

WASHINGTON. — Congressional leaders are hopeful of making at least a good start on passage of the Harris gas bill this year.

Their strategy called for an order by the House rules committee sending to the floor the bill to exempt independent natural-gas producers from Federal Power Commission regulation.

Chairman J. Percy Priest of the House interstate commerce committee will go before the rules committee July 26. If the House schedule permits, the bill will be brought up toward the end of the week.

Developments over the weekend indicate that the bill has a good chance of passage by the House. A poll taken of House leaders was said to show it will go over by a comfortable margin. But the opposition is prepared to put up a stiff fight. Some amendments will be offered from the floor, if the rules committee permits them, and a motion to recommit the bill to Priest's committee also is likely.

Senate action unknown . . . Whether the Senate will take the measure up this session is still an unanswered question. It is seen as getting through the Senate if it is brought up.

But the Senate has no limitation on debate, and the bill would be good for several days of argument. There is still much legislation to be dealt with before adjournment but the Harris bill, while approved by President Eisenhower, is not on his must list and could be laid aside until next year.

Rumored Plant Set

Texas Butadiene plans early construction of $26,000,000 alkylate-butadiene plant to supply military requirements

HOUSTON. — A combination avgas-alkylate and butadiene plant will be started here soon by Texas Butadiene & Chemical Corp.

Plans for the plant were announced after the Armed Services Petroleum Purchasing Agency granted the company a "facility-expansion contract." Under the contract, ASPPA will get first call on the alkylate and aviation gasoline products. In return, the Government will underwrite standby maintenance costs if the plant is forced to shut down for lack of markets in the first 5 years of operation.

The output of the plant will be pegged to demand from the government agency. When the demand for alkylate and avgas drops, the output of butadiene will be stepped up, and vice versa. The plant will be designed for an annual production of 2,500,000 bbl. of avgas with 17,000 tons of butadiene. The plant's design will allow this production of avgas to decrease and the butadiene capacity to increase. The top capacity for butadiene alone will be 43,000 tons annually.

The $26-million plant will include the first privately-financed butadiene facilities. The nation's nine other butadiene plants were built by the Government. Seven of these plants recently came under private ownership when the Government disposed of most of its synthetic-rubber plants. Eight of the former government plants are operated on petroleum and one of alcohol.

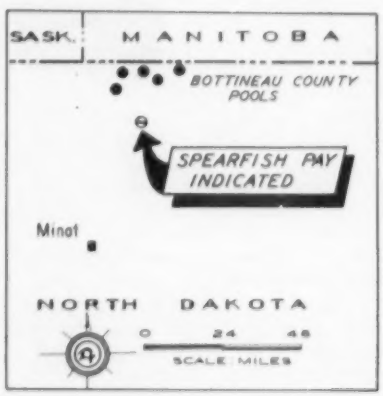
Talk of the Texas Butadiene & Chemical plant has been circulating about a year *(The Oil and Gas Journal, May 3, 1954)*. The company was organized in July 1954 *(The Oil and Gas Journal, July 12, 1954)*.

Backers . . . In announcing plans for the plant, it also was revealed that Godfrey L. Cabot, Inc., Boston, one of the nation's leading carbon-black manufacturers, is the largest single stockholder in the company. In previous reports, Cabot was not listed as a backer of the venture. E. L. Green, Jr., vice president of Cabot Carbon Co., a Cabot subsidiary, is president of Texas Butadiene & Chemical.

Also furnishing equity capital for the Houston plant will be Carl M. Loeb, Rhoades & Co., New York investment firm that has backed the company since its inception.

The plant will use normal butane and isobutane as feed stock. In earlier plans, Warren Petroleum Corp. was scheduled to supply the plant with feed stock, but a Warren official in Tulsa said the company is no longer connected with the venture. The plant will use Houdry Process Corp.'s dehydrogenation process.

Dr. Robert L. Purvin, of Purvin & Gertz, Dallas consulting engineers, originated the plan to produce butadiene and alkylate-avgas in an integrated plant. The plant will be constructed by Flour Corp., Ltd.



New Williston Pay?

Amerada wildcat shows oil in Spearfish formation

FARGO, N. D.—First production in the Williston basin from the Spearfish (Triassic) formation is indicated at a wildcat in Bottineau County, 18 miles south of the Canadian border.

The well is Amerada's 1 Beauchamp located in the Newburg area. It flowed oil on two production tests. Perforations were at 3,403-11 ft. in the base of the Spearfish formation. The first test flowed by heads. Production in 24 hours was 23 bbl. of oil, 27 bbl. of load oil, and 20 bbl. water. The second flowed, by heads, a total of 38 bbl. oil and 34 bbl. water in 24 hours. Both tests were through ¾-in. choke with tubing pressure zero.

Successful commercial completion of the wildcat would open the first Spearfish production. This Triassic red bed formation is widespread in northwestern Nebraska, the Dakotas, eastern Montana, and in the eastern Prairie Provinces of Canada. It is nearly 500 ft. thick in the Black Hills region, its type area. The formation takes its name from the town of Spearfish, S. D.

Oil from the Spearfish-Triassic would give the Williston basin production from eight geologic ages: Ordovician, Silurian, Devonian, Mississippian, Pennsylvanian, Triassic, Jurassic, and Cretaceous. Most of the basin's oil, however, comes from formations of Mississippian age.

Refinery Planned

15,000-bbl. plant will use domestic and foreign crude

TACOMA, Wash.—U. S. Oil & Refining Co. has set December 1956 as the on stream target for its 15,000-bbl. refinery to be built here.

U. S. Oil is the successor to Pacific Oil & Refining Co., which has been planning a Tacoma refinery for several years.

Dr. Ernest E. Lyder, president of the firm, was general manager of refineries for Standard Oil Co. of California until he retired several years ago.

Lyder said the plant, the third for the state in 2 years, would have the most modern catalytic process. However, he did not say how many or what kinds of catalytic processes the firm would build.

He said the plant's main products would be gasoline, diesel, stove and fuel oils, and aviation fuels.

Lyder did not reveal where the refinery would get its crude. He said the firm has long-term contracts for both domestic and foreign stocks, and that the crude would be tankered to the refinery.

John Ford, former vice president of W. A. Barnes Co., Los Angeles, is the prime contractor.

Time Oil Co., a large West Coast marketer, will handle the plant's products. W. G. French, secretary of Time, is also secretary of U. S. Oil.

Crude Line Nears Finish

BILLINGS, Mont.—Powder River Pipeline Co. is more than half through with its 79-mile, 6-in. crude-oil line from Sumatra field to the Billings-Laurel refining center.

Construction on the $1,000,000 line was started in June *(The Oil and Gas Journal, June 27, page 78)*. Art Hartwig, of Billings, is the contractor on the line. It is the first carrier in the state to move Montana crude to Montana refineries.

The line passes within 3½ miles of a discovery well brought in recently near Custer, Mont., by Atlantic Refining Co.

Action Due in Libya

Nine companies, including five U. S. firms, are expected to seek concessions now that favorable law is effective

Paul Swain

A FULL-FLEDGED oil exploration program will probably be under way in the North African Kingdom of Libya before the end of 1955.

Libya's new petroleum law became effective last week. At least nine international oil companies, five of them American, will probably file applications for concessions this week. Those granted concessions must begin operations within 8 months.

The new law was published in Libya's official gazette June 19 and became effective 30 days later. Under its terms all applications for concessions filed within 1 week, or before July 26, are considered as filed at the same time and will have equal priority.

American companies which have shown an interest in Libya's prospects include Standard Oil Co. (N.J.); Socony Mobil Oil Co., Inc.; American Overseas Petroleum, Ltd. (Caltex); Conorada Petroleum Corp.; and Hunt Oil Co., of Dallas.

In addition to the American firms, at least four European companies have done geological work and will probably apply for acreage in Libya. They are British Petroleum Co., Ltd., Royal Dutch-Shell, Omnium Francaise de Petrole, and Cie. Francaise des Petroles. *(The Oil and Gas Journal, May 16, page 136.)*

The country . . . Libya, formerly an Italian colony, was granted its independence and self-government by the United Nations January 1, 1952. With an area of about 1,100,000 sq. miles, of which only 3 per cent is arable land, Libya is one of the world's most underdeveloped countries and has staggering economic problems. Any influx of money from oil operations would have a great effect on the nation's economy.

The new law . . . Libya first began granting 1-year exploration licenses late last year after the passage of a mineral resources law by the new country's parliament. The law, however, allowed only preliminary geological work, and it was not until the petroleum law was passed that serious and detailed exploration work could be done. The new law received the approval of the parliament in April and then needed only the signature of King Idris and publication in the official gazette to become effective.

The law divides the country into four zones. The first is the province of Tripolitania; the second the province of Cyrenaica north of the 28th parallel; the third is Cyrenaica south of the parallel; and the fourth zone is the entire province of Fezzan. Provisions for concessions vary according to zones.

Operators may receive a concession for a period of up to 50 years and may renew it once, but the combined period of the concession and renewal may not exceed 60 years. A company may have as many as three concessions in the first and second zones, each limited to 30,000 sq. km. (11,600 sq. miles), and as many as four separate concessions in the third and fourth zones, each limited to 80,000 sq. km. (31,000 sq. miles).

Within the first 5 years of the concession in the first and second zones, operators must reduce the area to 75 per cent of the original size; to 50 per cent of original size at the end of 8 years and to ⅓ of the original size at the end of 10 years. The same general provisions apply to the third and fourth zones, except that the area must be reduced to 25 per cent of the original size at the end of 10 years. In no case is an operator required to reduce his concession to less than 3,000 sq. km. in the first and second zones, or 5,000 sq. km. in the third and fourth zones.

The new law requires concession holders to start work within 8 months after the granting of the concession and provides for a minimum schedule of expenditures that companies must make throughout the exploration phase.

Royalty to the government is fixed at 12½ per cent, and a 50-50 profit split is required after export production reaches 15,000 bbl. daily.

Applications . . . Because of the 7-day period in which all applications are to be considered with equal priority, most of the companies which have done preliminary work in Libya are expected to apply for concessions by this week. The law provides that in case of conflicting or overlapping applications, the first person to apply is given preference. Since, however, all applications filed in the 7-day period after the law becomes effective are to be considered filed the same day, there is almost certain to be some conflict.

In case of duplicate or overlapping applications, the companies themselves will be given a chance to settle the conflict. If they are unable to do so, the petroleum commission set up by the new law may require applicants to pool the overlapping areas or settle the dispute in any way it deems necessary.

Philippines May Open Lands

The Philippine Government is expected shortly to grant concessions for oil and mineral exploration with the help of American experts.

J. D. Cerkel, chief of the minerals classification branch of the U. S. Geological Survey, has gone to Manila as a member of a joint International Cooperation Administration mission to advise the government in the initial stages of concession negotiations. Cerkel helped draft new Philippine mineral laws after World War II.

Prospects for oil in the Philippines are said to be good, with sedimentary basins in some of the islands which may be equal to those in Sumatra. Since President Magsaysay has unified the country and established a stable government several American oil companies are said to be interested in concessions.

Concessions Still Doubtful

The question of granting concessions to foreign oil companies continues to be a political hot potato in both Italy and Argentina.

In Italy, where little progress has been made on a new petroleum law for the mainland, Communist-dominated unions warned last week they will fight any compromise with foreign companies. Giuseppe De Vittorio, a leading Communist and chief of the general conference on Italian petroleum, made the warning.

In Argentina, the Radical Party implied President Juan Peron had jeopardized both the national sovereignty and economy by negotiating a contract with Standard Oil Co. of California. The criticism, together with the general political unrest, may mean that chances of the bill's passage by the September 30 deadline may be decreasing. The bill will lapse if not ratified by that time.

Peron had urged the congress to approve immediately the 40-year contract with California Standard.

Stanolind Entering Cuba

Biggest exploration program yet undertaken on the island is expected to follow if contract details are worked out

THE biggest exploration program since Cuba's modern oil boom was sparked in May 1954 is planned on the Caribbean island by Stanolind Oil & Gas Co.

It could develop into the biggest in Cuba's history if initial plans are borne out during the next 5 years.

Cuban sources say Stanolind will spend as much as $10,000,000 for seismological, geophysical, and exploratory work. In Tulsa, however, the American company declined to comment on this figure or other details at this stage.

Stanolind has already reached preliminary agreement with Cia. Petrolera Trans Cuba, S.A., and the Cuban Venezuelan Oil Voting Trust, according to a Havana report. If details are worked out, they are expected to sign a formal contract, perhaps next week, wrapping up the deal.

The concession involves more than 8,600,000 acres along the southern coast of Cuba, in Camaguey and Las Villas provinces. It was in southwestern Camaguey that Cuban independents, using a crew furnished by Kerr-McGee Oil Industries, Inc., Oklahoma City, brought in the Echevarria discovery last year.

Production from the 640-acre Echevarria field, still being developed, now exceeds 1,000 bbl. a day. This is several times the combined output from Cuba's three old fields which date as far back as 1864.

Stanolind's program, if undertaken, will be the first major investment on Cuba's southern coast, including offshore areas. The American company would drill at least 40,000 ft. of hole per year over the 5-year period.

Deal is 50-50 . . . Stanolind and the Cuban companies have agreed on a 50-50 split in any production and profits. After the first 5 years, operating expenses will be split should oil be discovered on the original concession.

CVOVT manages 24 companies which formed the operating group to comply with Cuban land laws. The group controls concessions on almost 17,000,000 acres. All leases must be approved by the government, which owns the mineral rights.

Trans Cuba owns 50 per cent working interest in CVOVT, and is drilling its third well in Camaguey under a $3,000,000 exploration program, of which $1,000,000 was obtained from the Cuban Government. No substantial production has been found.

Viriato Gutierrez, Cuban sugar magnate, is president of Trans Cuba. Warren W. Smith, Caracas, Venezuela, former president of Pantepec Oil Co., is chairman of Cuban Venezuelan.

Stanolind apparently is buying out some concession holders who obtained farmouts from Cuban Venezuelan and Trans Cuba earlier, in addition to obtaining original concessions. Boundary details have not been released.

But Stanolind's program is planned in the same general area occupied in part by Kerr-McGee, Cuban American Drilling & Exploration Co., Pacific Petroleums, Ltd., Crescent Corp. (formerly Deep Rock), and Sterling Oil Co. of Oklahoma, Inc., American Leduc Petroleums, Ltd., Cuban Colombian Petroleum Co., and other interests.

The picture is hazy. The Cuban Ministry of Agriculture, which must approve concession applications, is snowed under by requests made in the excitement of the original discovery. Government surveys are holding up several deals.

Race is hot . . . Stanolind's move is the latest in the frenzied race to find oil in Cuba, a race which the government is pushing strongly in an effort to find a new commodity to bolster its sugar economy.

Millions were spent in the past quarter century in a futile search for oil by such firms as Atlantic Refining Co., Standard Oil Co. (N. J.), Gulf Oil Corp., Shell Oil Co., and others. Then came Echevarria 1, which came in flowing 192 bbl. daily at 1,072-88 ft. Other wells were sunk in rapid succession.

Now the little field has 16 producers, 9 by Kermac on the 15,000-acre concession in which it holds 25 per cent interest. The others were drilled by American Leduc, whose concession borders Kermac's.

Since then the government has been deluged with applications for concessions covering the entire island and much of its tidelands. Cuban independents are caught up in the oil fever, eager to be in on the ground floor if their homeland is to make a major petroleum strike.

The new boom has also attracted the international giants. New exploration programs are under way or planned by Standard Oil Co. of California, Jersey Standard, Gulf, and Shell, along with many well-heeled independents.

In the 15 months following the Echevarria discovery, the only significant wildcat brought in outside the Jatibonico area of Camaguey has been in Havana Province, some 200 miles to the southeast.

Wildcat near old field . . . The Salmon-Maxzidal 1 Cruz-Verde was brought in at 1,055 ft. at 150-200 bbl. per day. The location is just east of Havana, and near the old Bacuranao field discovered in 1864.

Across Havana Bay is a producer drilled by Jones Oil Enterprises of Cuba, headed by Ted Jones, Shreveport drilling contractor and owner of a string of theaters on the West Coast. The Jones well is 18 miles east of Havana. Bottomed at 3,475 ft., it was brought in at 40 bbl. per day. Jones predicted this spring it would reach 200 bbl. when placed on pump.

Kermac's rig is now idle while engineers and geologists study means of increasing production and spacing of subsequent wells. Halliburton Oil Well Cementing Co. is fracturing Echevarria 7 to see if this treatment holds any promise for the field.

This will be the first fracture treatment on the island. No wells have been acidized.

Comparatively little is known at this stage about the oil potential, even in Echevarria field. The production source is not fully established, and field limits remain to be defined.

The rest of the island is even more of a mystery, despite the 2,000 or so wells drilled in past years and the current activity of some 30 rigs. The "big" discovery, if there will be one, is yet to be made. And the Cuban exploration race is still wide open.

SASOL Fuel Ready for Sale

Gasoline from the South African Government's $114 million SASOL coal-to-oil synthesis plant is expected to go on sale later in July.

The Union's four leading distributors—subsidiaries of Standard-Vacuum, Shell, Cal-Tex, and Atlantic—will market 73 per cent of the plant's 4,300 bbl. daily production. A SASOL-owned company will market the rest.

The gasoline will sell for about 1 cent per gallon less than the imported product which is priced at the equivalent of about 37 cents per American gallon.

The synthesis plant will supply about 15 per cent of the Union's requirements—some 28,000 bbl. daily. Initial operation of the plant began late last year *(The Oil and Gas Journal, December 13, 1954, page 103).*

New records will be set as

Industry Heads Toward 56,500 Wells in 1955

Here's a quick glance at some salient figures as the second half swings into stride . . .

	First Half	Year 1955	Change from 1954 Amount	Pct.
TOTAL COMPLETIONS	27,696	56,430	2,500	4.6
WILDCAT COMPLETIONS	5,840	12,168	888	7.9
TOTAL FOOTAGE	110,208,318	226,505,000	7,518,519	3.4
CRUDE PRODUCTION	6,793,000	6,712,000	366,000	5.8
GAS-LIQUIDS PRODUCTION	712,000	718,000	38,000	5.6
CRUDE IMPORTS	734,500	742,000	86,000	13.1
PRODUCT IMPORTS	493,000	451,000	55,000	13.9
REFINERY RUNS	7,367,000	7,339,000	381,000	5.5
TOTAL DEMAND	8,641,000	8,579,000	471,000	5.8
EXPORTS	329,000	315,000	—41,000	—11.5
DOMESTIC DEMAND	8,312,000	8,264,000	512,000	6.6
GASOLINE	3,515,000	3,578,000	185,000	5.5
MID. DISTILLATE	1,981,000	1,899,000	133,000	7.5
RESIDUAL FUEL	1,580,000	1,514,000	84,000	5.9

Read the next two pages for a hasty resume
and the following 28 pages for detailed facts and figures

...a glance behind

Drilling – nearly quarter-billion feet of hole put down...

Drilling will hit a new high record of 56,430 wells this year—up a whopping 2,500 (4.6 per cent) above 1954. Last 6 months of this year will see 28,734 completions—1,038 more than during the first 6. The increased tempo is pretty general; most operators have upped their 1955 drilling programs around 5 per cent since January. Average footage per well is running slightly less than last year.

Wildcatting – new records for both halves...

Wildcat drilling will increase faster than development drilling during remainder of year. The programed 6,422 wildcats is 6.5 per cent above last half of 1954 and 10 per cent over first half of 1955. This will bring wildcats to 22.35 per cent of total wells—best ratio in more than 2 years. Results of first half's wildcatting: 5,840 completions, 883 oil, 177 gas, 4,780 dry.

Completions – last half sets new high...

Completions during first half: 5,840 wildcats, 21,856 field wells, 27,696 total—best 6 months in history. Total footage of 110,208,000 ft. also a new record. The figures surpassed the first half of 1954 by: 1,782 total wells (6.9 per cent), 589 wildcats (11.2 per cent), 1,203 field wells (5.8 per cent).

Crude Production – up 5.8 per cent for year...

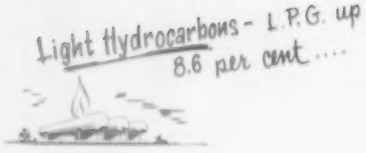
Crude production averaged 6,793,100 bbl. per day (including lease condensate) during first 6 months—best first half in history and 341,200 bbl. above first half of 1954. But because so much went into building stocks, outlook is that the last half will average lower—forecast now at 6,632,500. bbl. daily. This will bring year's average to 6,712,000—up 5.8 per cent over '54.

Refining – more gasoline, less kerosine and resid...

Refineries ran 7,367,000 bbl. of crude per day during first half, up 5.9 per cent over same part of last year. Forecast: 7,205,000 third quarter (up 4.3 per cent), 7,420,000 fourth quarter (up 5.8 per cent), bringing 1955 daily average to 7,339,000 bbl.—5.5 per cent over '54. Significant trend: Yield of resid down; coke, asphalt, road oil up.

and a look ahead...

Output of natural-gas liquids reached the new high of 712,400 bbl. daily during first half, up 5.5 per cent above same part of last year. (It's now 9.5 per cent of our total liquid production). But L.P.G.'s percentage gain (8.6) is one of the smallest in years. Trend: Growth of L.P.G. is slowing down toward rate of increase of natural gasoline and other N.G.L.

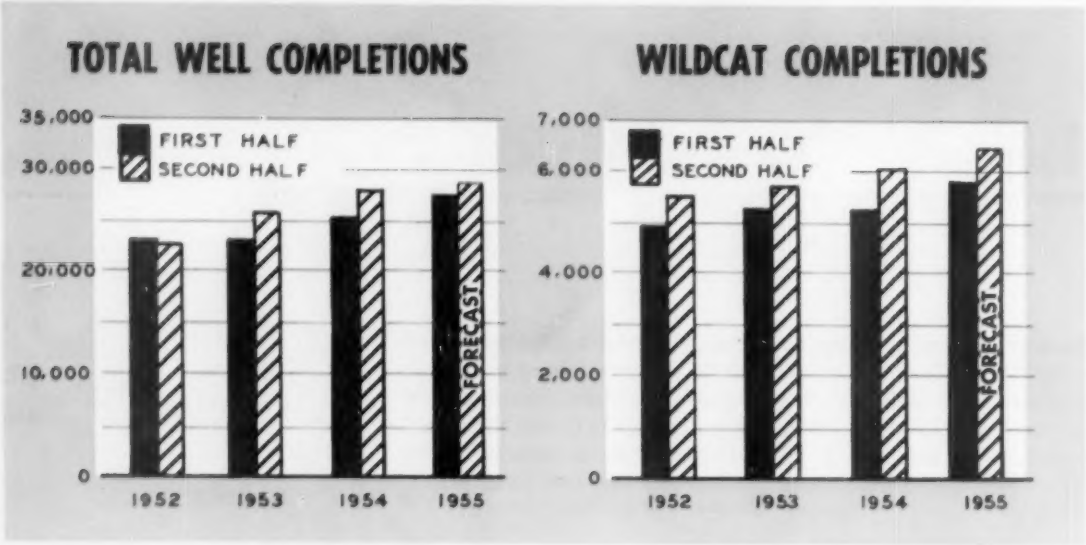


Crude imports averaged 734,500 bbl. per day during first half—up 100,800 bbl. per day (15.9 per cent) over first half of year. Products imports averaged 493,000 bbl. per day—up 89,200 bbl. (22.1 per cent). Prospect for second half: Crude imports 750,000 bbl. per day—up 72,000 (10.6 per cent) over last half of last year; products imports 410,000 bbl. per day—up 22,000 (5.7 per cent). Full year's total imports will average 1,193,000 bbl. per day—13.4 per cent over '54.

Demand is back in groove. First-half average of 8,641,300 bbl. daily (total demand all oils) was 6.8 per cent above the abnormally low 1954. Forecast for second half: 8,517,500, or 4.9 per cent over '54's last half. This will make 1955 average 8,579,000 bbl. daily for a gain of 5.8 per cent—in line with postwar growth. Outstanding demand changes: gains in distillate and residual, drop in kerosine.

Foreign crude output hit 6,661,900 bbl. daily (noncommunist) during first half—up 15.5 per cent over first half 1954. Western Hemisphere (excluding U.S.) gained 12.9 per cent; Middle East, 19.4 per cent; Far East, 7.1 per cent; Europe and Africa, 10.8 per cent; Communist areas, 8.5 per cent. This compares with United States figures of 6,793,000 bbl. and 5.3 per cent.

Natural gas won't increase its interstate movement as fast as in recent years. It could flatten off or decrease if (A) Government fixes field price so low as to discourage producers from selling to transporters, thus reducing supply; or (B) freed prices rise so high as to discourage consumers from buying, thus reducing demand.



Biggest drilling year in history in making

Operators See 56,430 Wells Drilled This Year

by John C. Casper

WILDCAT drilling will increase at a faster rate than development drilling in the last half of the year. Total percentage gain in footage for the full year will be slightly less than the gain in total completions, indicating a small decrease in average depth. New records will be set by both completions and total footage.

Oil operators' plans at midyear point to the biggest drilling year in history with completions above 56,000 wells for the first time. Wildcat completions will move up to almost 12,300 wells for the year with total development drilling climbing almost to 44,200 wells. Total drilled footage will pass 225,000,000 ft. for the first time.

The upward revision in forecasts of wells and footage for the year is in line with changes in industry plans as reported at midyear. As a check on these changes, each report received at midyear was compared with the company's original estimate made at the first of the year. In the first-of-the-year survey, each operator was asked how many wells he planned for each state or area, broken down into wildcat, development, and service wells. At midyear, he was asked to list total wells completed in the first half and also to report all work scheduled for the second half. Totals for the two halves were compared with the original estimate made at the first of the year.

The tabulation of these comparisons show that reporting operators' plans at midyear called for 3 per cent more wildcats and 5 per cent more total wells than at the first of the year. The Journal's forecast of total drilling for the year has been raised 3.6 per cent and the wildcat forecast 1.9 per cent.

The Journal's percentage revision varies from the over-all increase reported by operators, since the drilling totals from the surveys represent varying per-

Forecast for Year 1955

(First half actual plus last half forecast)

	Wildcat wells	Field wells	Total wells	Total footage (thou. ft.)
Alabama	45	1	46	203
Arkansas	190	471	661	2,203
California	531	2,072	2,603	12,873
Colorado	781	645	1,426	7,735
Florida	40	1	41	280
Illinois	631	3,139	3,770	9,109
Indiana	323	480	803	1,221
Kansas	1,048	4,037	5,085	18,081
Kentucky	281	1,043	1,324	2,331
Louisiana	724	3,387	4,111	26,096
North	205	1,905	2,110	6,044
South	519	1,482	2,001	20,052
Michigan	204	311	515	1,535
Mississippi	213	303	516	3,826
Montana	146	218	364	1,876
Nebraska	313	379	692	3,910
New Mexico	172	1,379	1,551	6,714
New York	5	501	506	757
North Dakota	61	176	237	1,727
Ohio	29	1,040	1,069	2,267
Oklahoma	875	7,400	8,275	26,923
Pennsylvania	32	813	845	2,109
South Dakota	9		9	49
Texas	5,283	15,135	20,418	88,552
Dists. 1 and 4	1,024	2,196	3,220	12,419
Dists. 2 and 3	844	1,801	2,645	16,898
Dists. 5 and 6	369	689	1,058	5,327
Dists. 7-B and 9	2,061	5,289	7,350	22,372
Dists. 7-C and 8	918	4,255	5,173	28,180
Dist. 10	67	905	972	3,356
Utah	60	24	84	430
West Virginia	34	601	635	1,531
Wyoming	210	592	802	3,990
Miscellaneous	22	20	42	177
Total United States	12,262	44,168	56,430	226,505
Western Canada	776	1,928	2,704	11,829

centages of total drilling by states. The best coverage was for South Louisiana where the survey total for the first half accounted for 80 per cent of total drilling.

The total of completions for the last half is forecast at 28,734 wells, including 6,422 wildcats and 22,312 development wells. This total represents a gain of 2.5 per cent over the last half of 1954 and is up 3.7 per cent from the first half record.

Wildcat completions for the last half will show increases of 6.5 per cent and 10.0 per cent over the last half of 1954 and the first half of 1955 respectively. This larger percentage increase in wildcats will result in a gain in the ratio of wildcats to total wells to 22.35 per cent, the highest ratio since the first half of 1953.

Recent large increases in drilling in relatively shallow areas have tended to lower the total footage drilled for an average well. Average footage for the full year 1955 will be slightly less than the average for 1954. However, the reduction can be charged to shallow drilling in the first half of the year. The average depth of wells for the last half is expected to exceed the average for the first half but not by enough to prevent a reduction for the year.

The average well in the first half of 1954 was 4,123 ft. deep, but dropped to 4,003 ft. for the last half and to 3,979 ft. for the first half of 1955. The forecast for the last half shows an average of 4,047 ft.

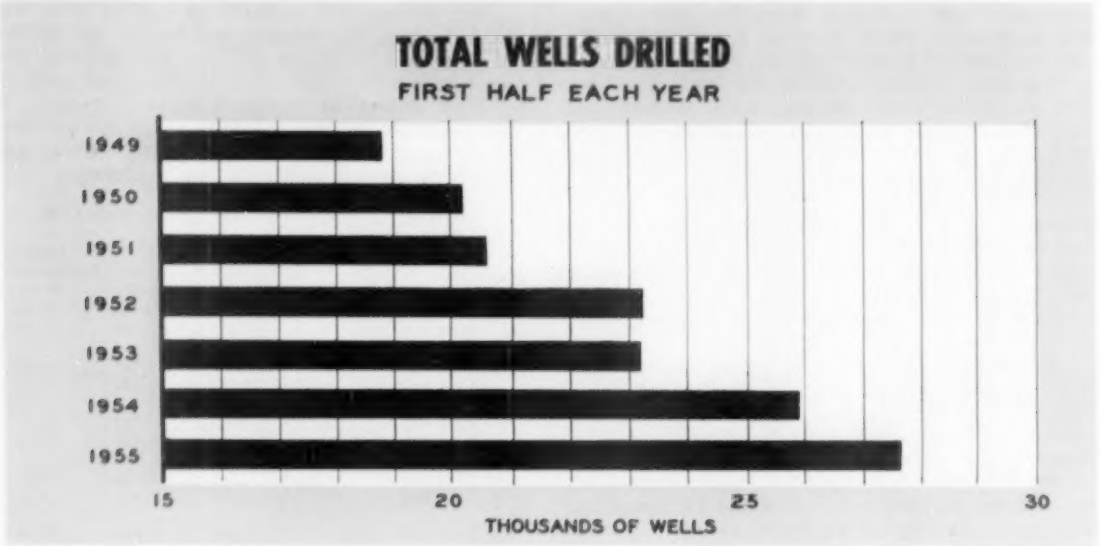
Total drilling in western Canada is forecast at 2,704 wells for the year compared with 2,201 in 1954. All of the gain is in development drilling with a large part of the increase credited to the big Pembina field.

WILDCAT PERCENTAGE OF TOTAL DRILLING

	Wildcat wells	Total wells	Wildcat per cent of total
1951: First half	4,531	20,766	21.82
Last half	5,771	23,750	24.30
1952: First half	4,992	23,187	21.53
Last half	5,560	22,634	24.56
1953: First half	5,309	23,163	22.92
Last half	5,753	26,116	22.03
1954: First half	5,251	25,904	20.27
Last half	6,029	28,026	21.51
1955: First half	5,840	27,696	21.09
Last half	6,422	28,734	22.35

Drilling Forecast, Last Half, 1955

	Forecast last half 1955				Increase over last half 1954			
	Wildcat wells	Field wells	Total wells	Total footage (thou. ft.)	Wildcat wells	Field wells	Total wells	Total footage (thou. ft.)
Alabama	21		21	93	— 4	— 3	— 7	— 51
Arkansas	88	227	315	1,050	— 4	— 42	— 46	— 230
California	285	1,004	1,289	6,395	18	141	159	1,097
Colorado	410	345	755	4,095	12	7	19	158
Florida	22		22	165	7	— 1	6	66
Illinois	328	1,605	1,933	4,670	79	53	132	365
Indiana	155	268	423	645	20	—104	— 84	— 134
Kansas	560	1,975	2,535	9,050	82	— 33	49	302
Kentucky	149	545	694	1,260	43	— 7	36	19
Louisiana	408	1,734	2,142	13,835	84	76	160	2,079
North	113	961	1,074	3,100	— 32	— 43	— 75	— 310
South	295	773	1,068	10,735	116	119	235	2,389
Michigan	97	163	260	775	— 19	— 3	— 22	— 8
Mississippi	118	157	275	2,040	19	21	40	343
Montana	98	115	213	1,111	16	— 8	8	261
Nebraska	159	188	347	1,960	42	10	52	334
New Mexico	91	703	794	3,440	14	162	176	348
New York	5	256	261	390	2	118	120	172
North Dakota	41	88	129	930	— 32	— 29	— 61	— 406
Ohio	12	522	534	1,130	5	— 86	— 81	— 121
Oklahoma	458	3,546	4,004	13,110	— 27	—264	—291	—1,126
Pennsylvania	20	460	480	1,205	— 5	—223	—228	—1,019
South Dakota	3		3	16	— 10		— 10	— 35
Texas	2,714	7,745	10,459	45,610	110	627	737	2,689
Dists. 1 and 4	536	1,128	1,664	6,480	107	248	355	869
Dists. 2 and 3	426	937	1,363	8,690	8	80	88	493
Dists. 5 and 6	194	375	569	2,865	10	— 19	— 9	— 113
Dists. 7-B and 9	1,060	2,625	3,685	11,240	— 14	— 41	— 55	— 295
Dist. 7-C and 8	457	2,230	2,687	14,630	8	366	374	1,728
Dist. 10	41	450	491	1,705	— 9	— 7	— 16	7
Utah	33	14	47	240	— 11	— 1	— 12	31
West Virginia	18	320	338	815	— 11	— 4	— 15	— 164
Wyoming	117	315	432	2,150	— 27	—101	—128	— 884
Miscellaneous	12	17	29	117	— 10	9	— 1	23
Total United States	6,422	22,312	28,734	116,297	393	315	708	4,109
Western Canada	450	1,105	1,555	6,797	— 12	287	275	2,246



Good year any way you look at it

Total Completions Mark First-Half Record

by Carl Hoot

- **Development Completions . . . Up 5.8 per cent**
- **Wildcat Completions . . . Up 11.2 per cent**
- **Total Completions . . . Up 6.9 per cent**

THE drilling picture for the first half of 1955 was good from almost any angle, for all producing areas. Field wells and wildcats held strong and slightly exceeded forecasts made at the first of the year.

West Texas . . . The unusually high success ratio of new strikes, to 10,000 ft. or more, in Midland, Ector, Upton, and other counties along the Central Basin platform in western West Texas, kept things moving in this area. These strikes spurred further deep exploration and leasing. A midyear count of active rotary rigs in the Permian basin, including Southeast New Mexico, showed 551 wells drilling. This was near the 1955 record set May 10, and the second time rotary-rig activity has climbed above the 550 level during the last year and a half.

South Texas . . . This area had its biggest development in the Frio sand and Austin chalk play.

COMPLETIONS BY STATES—DEPTH CLASSIFICATIONS

	0-1,250 ft.	1,250-2,500 ft.	2,500-3,750 ft.	3,750-5,000 ft.	5,000-7,500 ft.	7,500-10,000 ft.	10,000-12,500 ft.	12,500-15,000 ft.	Over 15,000 ft.
Alabama	5	2	4	3	10	1	0	0	0
Arkansas	8	100	156	38	41	3	0	0	0
California	111	158	171	376	246	158	70	18	6
Colorado	2	3	19	161	467	17	1	1	0
Florida	0	0	1	9	6	0	2	1	0
Illinois	196	629	1,004	7	1	0	0	0	0
Indiana	165	163	52	0	0	0	0	0	0
Kansas	21	240	1,312	895	82	0	0	0	0
Kentucky	260	228	127	15	0	0	0	0	0
Louisiana	34	728	108	73	201	322	315	153	35
North	29	717	87	38	109	44	12	0	0
South	5	11	21	35	92	278	303	153	35
Michigan	23	86	57	66	23	0	0	0	0
Mississippi	2	3	4	24	129	36	42	1	0
Montana	0	27	27	34	26	35	1	1	0
Nebraska	2	4	19	38	282	0	0	0	0
New Mexico	16	139	281	129	107	25	44	16	0
Northwest	2	104	31	12	61	1	1	0	0
Southeast	14	35	250	117	46	24	43	16	0
New York	0	245	0	0	0	0	0	0	0
North Dakota	0	0	22	2	5	76	2	1	0
Ohio	175	130	213	12	5	0	0	0	0
Oklahoma	466	1,320	1,298	481	415	214	61	16	0
Pennsylvania	20	260	51	4	24	6	0	0	0
South Dakota	0	0	2	1	1	2	0	0	0
Texas	869	2,171	1,944	1,610	2,024	966	256	110	9
North Central	552	1,304	616	607	524	47	15	0	0
West	53	268	540	447	658	290	129	100	1
Panhandle	1	24	399	23	18	11	3	2	0
East	39	54	39	128	162	60	6	1	0
Gulf Coast	35	61	103	201	387	409	72	6	8
Southwest	189	460	247	204	275	149	31	1	0
Utah	4	8	2	3	11	7	2	0	0
West Virginia	9	152	85	42	8	0	0	1	0
Wyoming	27	22	67	70	104	63	13	4	0
Miscellaneous	2	2	1	3	2	2	1	0	0
Total U. S.	2,417	6,820	7,027	4,096	4,220	1,933	810	323	50

Texas Gulf Coast . . . There was a high tempo of successful drilling in old and new areas from Corpus to Sabine Pass. Directional drilling at Sprint field, off Padre Island, added a new gas well, but a second slanted hole was dry.

South Louisiana . . . Development drilling held steady in and around old and new producing areas of the bayou and sea-marshlands. The heaviest concentration of drilling was in the Mississippi River Delta region, both on and offshore.

Oklahoma . . . The Bradley-Lindsay district of Garvin, Grady, and McClain counties was consistently the busiest area in Oklahoma, rigwise and completionwise.

Rocky Mountains . . . Denver basin retained first place in activity for the entire region; San Juan basin gas-development work was on the upgrade. Northwest Sumatra was the busiest field in Montana for the second straight year.

Eastern interior . . . One of the country's biggest field-development stories was at Eldorado, in Illinois. Prolific wells, making 1,000-2,000 bbl. per day, were completed in this field.

WELL COMPLETIONS BY MONTHS

Wildcat Completions

	Jan.	Feb.	Mar.	Apr.	May	June
Oil	132	138	146	178	134	155
Gas	33	18	34	33	32	27
Dry	762	708	785	849	769	907
Total	927	864	965	1,060	935	1,089

Development Completions

Oil	2,354	2,202	2,592	2,609	2,460	2,643
Gas	228	209	230	247	273	279
Dry	835	796	901	1,026	945	1,027
Total	3,417	3,207	3,723	3,882	3,678	3,949

Total Completions

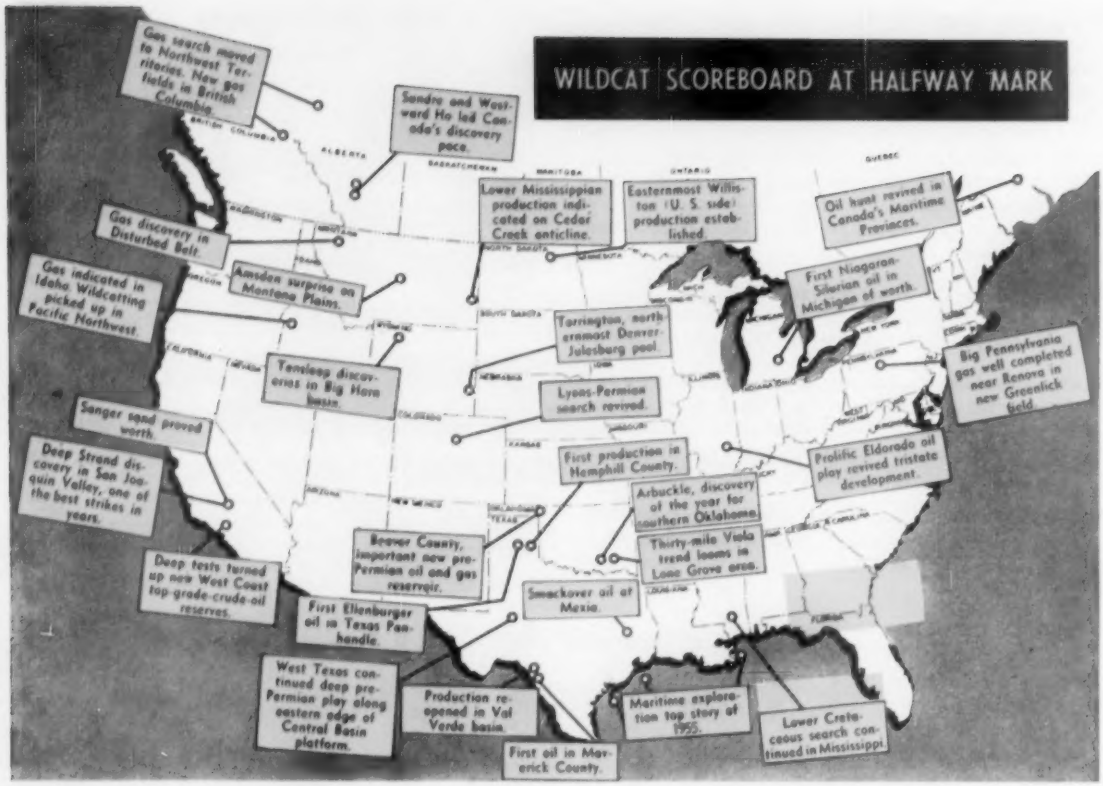
Oil	2,486	2,340	2,738	2,787	2,594	2,798
Gas	261	227	264	280	305	306
Dry	1,597	1,504	1,686	1,875	1,714	1,934
Total	4,344	4,071	4,688	4,942	4,613	5,038

Footage (Thousands of Feet)

Wildcat	4,461	4,212	4,659	5,034	4,728	5,091
Development	13,117	12,480	13,964	14,309	13,749	14,404
Total	17,578	16,692	18,623	19,343	18,477	19,495

Summary of Completed Wells, First 6 Months

	Total wells	Oil	Gas	Dry	Service	Footage (thou. ft.)	Total Jan.-June 1954
Alabama	25	0	0	25	0	110	35
Arkansas	346	185	3	158	0	1,153	304
California	1,314	975	27	307	5	6,478	1,223
Colorado	671	187	30	454	0	3,641	622
Florida	19	0	0	19	0	115	15
Illinois	1,837	1,013	2	820	2	4,439	1,334
Indiana	380	97	15	268	0	576	380
Kansas	2,550	1,286	209	1,052	3	9,031	2,236
Kentucky	630	250	90	289	1	1,071	530
Louisiana	1,969	1,307	138	521	3	12,261	1,629
North	1,036	760	69	207	0	2,944	861
South	933	547	69	314	3	9,317	768
Michigan	255	94	5	155	1	760	285
Mississippi	241	96	1	144	0	1,786	206
Montana	151	72	4	75	0	765	138
Nebraska	345	125	2	218	0	1,950	177
New Mexico	757	438	204	115	0	3,274	508
Northwest	212	2	180	30	0	714	141
Southeast	545	436	24	85	0	2,560	367
New York	245	115	0	3	127	367	294
North Dakota	108	80	0	28	0	797	122
Ohio	535	255	105	158	17	1,137	567
Oklahoma	4,271	2,655	171	1,295	150	13,813	4,491
Pennsylvania	365	114	118	36	97	904	623
South Dakota	6	0	0	6	0	33	10
Texas	9,959	6,141	309	3,506	3	42,942	9,143
North Central (7-B & 9)	3,665	2,144	22	1,499	0	11,133	3,398
West (7-C & 8)	2,486	1,904	22	560	0	13,550	2,118
Panhandle (10)	481	370	71	40	0	1,651	451
East (5 & 6)	489	203	49	237	0	2,461	475
Gulf Coast (2 & 3)	1,282	633	87	561	1	8,208	1,380
Southwest (1 & 4)	1,556	887	58	609	2	5,939	1,321
Utah	37	8	3	26	0	190	32
West Virginia	297	41	199	57	0	716	261
Wyoming	370	208	8	154	0	1,840	661
Miscellaneous	13	1	0	12	0	59	78
January-June 1955	27,696	15,743	1,643	9,901	409	110,208	
January-June 1954	25,904	14,582	1,850	8,968	504	106,799	
Western Canada 1955	1,149	801	52	296	0	5,032	921


WILDCAT SCOREBOARD AT HALFWAY MARK
Gas search moved to Northwest Territories. New gas fields in British Columbia.
Sandra and Westward Ho led Canada's discovery pace.
Lower Mississippian production indicated on Cedar Creek anticline.
Easternmost Williston (U. S. side) production established.
Oil hunt revived in Canada's Maritime Provinces.
Gas discovery in Disturbed Belt.
Amsden surprise on Montana Plains.
First Niagaran-Silurian oil in Michigan of worth.
Gas indicated in Idaho. Wildcatting picked up in Pacific Northwest.
Torrington, northernmost Denver-Julesburg pool
Big Pennsylvania gas well completed near Renova in new Greenlick field.
Tensleep discoveries in Big Horn basin.
Lyons-Permian search revived.
Sanger sand proved worth.
First production in Hemphill County.
Prolific Eldorado oil play revived tristate development.
Deep Strand discovery in San Joaquin Valley, one of the best strikes in years.
Arbuckle, discovery of the year for southern Oklahoma.
Thirty-mile Viola trend looms in Lone Grove area.
Beaver County, important new pre-Permian oil and gas reservoir.
Deep tests turned up new West Coast top-grade-crude-oil reserves.
Smackover oil at Mexia.
First Ellenburger oil in Texas Panhandle.
West Texas continued deep pre-Permian play along eastern edge of Central Basin platform.
Production reopened in Val Verde basin.
Maritime exploration top story of 1955.
Lower Cretaceous search continued in Mississippi
First oil in Maverick County.

Offshore, deep, and far reaching

Wildcatters Stretch Oil Frontiers on all Sides

by John C. McCaslin
District Editor

THE wildcat drill plunged deep into tideland waters, foothills and northern wasteland, sand and farm country during the first half, stretching exploratory frontiers from Detroit to Bakersfield . . . and from the Northwest Territories to the Mississippi River Delta.

Maritime exploration was the top North American wildcat story. . . Two Mississippian discoveries in Alberta coupled with remote gas finds in the far north gave western Canada an undisputed No. 2 rating as the outstanding first-half petroleum province. . . Deep drilling into the Paleozoics featured Mid-Continent wildcatting. . . Ellenburger and Devonian rocks were the deep West Texas objectives. . . Important strikes in California added new top-grade deep crude reserves to West Coast coffers. . . Rapid development of the prolific Eldorado field in Illinois plus a deep Silurian discovery near Detroit captioned the wildcat story east of the Mississippi River. . . A record number of wildcats were drilled in the Rocky Mountain province, but few startling developments were noted. . .

Along the gulf . . . The drilling story of 1955 is being written along the Gulf Coast and in the Louisiana Mississippi River Delta region. The score for the first 6 months of 1955 reads as follows:

- 13 Louisiana offshore discoveries (new fields)
- 6 Texas offshore discoveries
- 53 Active offshore operations

The offshore gamble by big operators on the Louisiana Gulf Coast is paying off big dividends. Emergence of South Louisiana as the nation's No. 1 exploratory province is due to rich reserves, fast payouts on investments, a success ratio of nearly 50 per cent, and the ever-increasing number of seismic crews and active rotary rigs both on and offshore.

The prime target of Louisiana Gulf Coast exploration is the thick, prolific, Miocene sands. This thick Miocene section is found both offshore and in the bayou regions close to the Gulf of Mexico. Recoveries are high. Focal points of first-half success were the Mississippi River Delta and adjacent offshore areas. Texas offshore strikes were made southwest of Port Aransas off Mustang Island, near Padre Island, southeast of Galveston, and southwest of Sabine Pass off Jefferson County.

Oil's northern dominion . . . Foothill and near-Arctic exploration, dominated the Canadian exploration scene. That country's two big oil strikes were made at Westward Ho and Sundre in Alberta. The gas-finders moved into the Northwest Territories and northeastern British Columbia.

. . . Westward Ho. This Mississippian discovery, no doubt the most significant since Turner Valley, was completed last winter for 1,002 bbl. of oil per day on ¼-in. choke. Confirmations and development wells are meeting success.

. . . Sundre. This strike netted 2,808 bbl. of oil per day. It is thought that Sundre and Westward Ho may lie on a common 7-mile long structure.

. . . Granite wash. This pay zone, rising fast in Canadian acclaim, first entered the 1955 exploration picture at Clear Hills in far northwestern Alberta. Later another discovery was made at Giroux Lake in a practically untested area.

. . . McKenzieland. First substantial gas production in the Northwest Territories turned Canadian exploration eyes to this wild region. A calculated open-flow potential of about 17,000 M.c.f. of gas per day was reported at Briggs 1 Rabbit Lake, 50 miles southwest of Fort Providence. The well is 350 miles from Alberta production.

. . . British Columbia. This westernmost Canadian province aimed for more gas reserves. New wells in and far to the north of Fort St. John put further impetus to the search for gas in Canada.

Mid-Continent . . . The most outstanding exploratory province in this area was the Hugoton embayment. The big pre-Permian push in the Oklahoma and Texas Panhandles and Southwest Kansas entered 1955 in full swing. First-half drilling brought Beaver County, Oklahoma, and Kiowa County, Kansas, major gas and oil reservoirs.

. . . Southern Oklahoma. The main event in Oklahoma exploration was the discovery of Arbuckle oil at a Carter County wildcat. Recovery was 5,000 ft. of oil on a deep drill-stem test. This discovery promises to bring new fame to the Arbuckle in this region. Discovery and rapid development of Viola lime oil production in the same area kept 10 rigs busy along a 30-mile trend in the Lone Grove area.

Deep West Texas . . . Rechecking old producing fields for the possibility of overlooked pre-Permian structures has paid off with more than a dozen big strikes this year. The West Texas drilling is finding rich rewards along the trend of Central Basin platform fields with the Ellenburger, Devonian, and Strawn as the chief objectives. Good wildcat success was also noted in southern Tom Green and northern Schleicher counties.

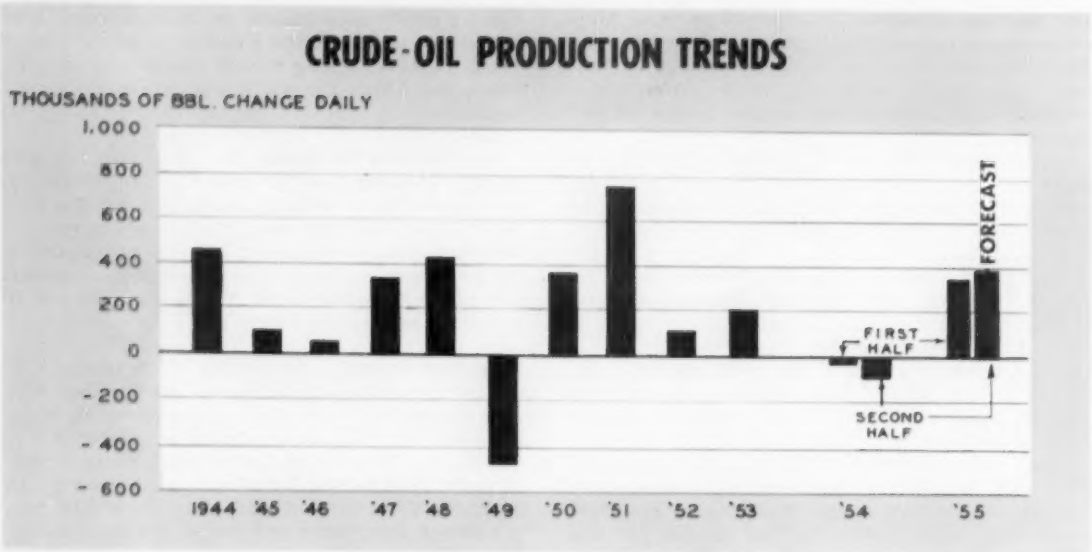
California digs deep . . . Wildcatting in California accented the deep with operators busy digging around and in famous old fields. One deep hole gave the central San Joaquin Valley one of the most important discoveries scored in recent years. Shell 1 Posuncula on the north side of Strand field, 12 miles west of Bakersfield, made 1,810 bbl. of 33.5°-gravity oil per day from the upper Vedder sand of lower Miocene age.

WILDCAT COMPLETIONS, FIRST 6 MONTHS

	Comp.	Oil	Gas	Dry	Footage (thou. ft.)
Alabama	24	0	0	24	106
Arkansas	102	16	2	84	351
California	246	25	8	213	1,400
Colorado	371	24	16	331	1,999
Florida	18	6	0	18	103
Illinois	303	32	1	270	637
Indiana	168	8	0	160	241
Kansas	488	72	18	398	1,978
Kentucky	132	24	5	103	212
Louisiana	316	103	13	200	3,052
North	92	14	1	77	497
South	224	89	12	123	2,555
Michigan	107	6	0	101	332
Mississippi	95	10	0	85	664
Montana	48	5	1	42	279
Nebraska	154	18	0	136	834
New Mexico	81	19	6	56	442
Northwest	25	2	6	17	78
Southeast	56	17	0	39	364
New York	0	0	0	0	0
North Dakota	20	1	0	19	129
Ohio	17	1	4	12	61
Oklahoma	417	73	18	326	1,765
Pennsylvania	12	0	5	7	76
South Dakota	6	0	0	6	33
Texas	2,569	433	68	2,068	12,766
North Central	1,001	195	7	799	3,669
West	461	76	6	379	2,681
Panhandle	26	7	7	12	191
East	175	19	3	153	908
Gulf Coast	418	71	24	323	3,138
Southwest	488	65	21	402	2,179
Utah	27	2	2	23	144
West Virginia	16	0	7	9	69
Wyoming	93	11	3	79	471
Miscellaneous	10	0	0	10	40
Jan.-June 1955	5,840	883	177	4,780	28,184
Jan.-June 1954	5,251	761	179	4,311	25,854

DEVELOPMENT COMPLETIONS, FIRST 6 MONTHS

	Comp.	Oil	Gas	Dry	Footage (thou. ft.)
Alabama	1	0	0	1	4
Arkansas	244	169	1	74	802
California	1,068	950	19	99	5,077
Colorado	300	163	14	123	1,642
Florida	1	0	0	1	12
Illinois	1,534	981	1	552	3,802
Indiana	212	89	15	108	336
Kansas	2,062	1,214	191	657	7,054
Kentucky	498	226	85	187	860
Louisiana	1,653	1,204	125	324	9,209
North	944	746	68	130	2,447
South	709	458	57	194	6,762
Michigan	148	88	5	55	428
Mississippi	146	86	1	59	1,122
Montana	103	67	3	33	487
Nebraska	191	107	2	82	1,115
New Mexico	676	419	198	59	2,832
Northwest	187	0	174	13	636
Southeast	489	419	24	46	2,196
New York	245	115	0	130	367
North Dakota	88	79	0	9	668
Ohio	518	254	101	163	1,076
Oklahoma	3,854	2,582	153	1,119	12,048
Pennsylvania	353	114	113	126	828
South Dakota	0	0	0	0	0
Texas	7,390	5,708	241	1,441	30,176
North Central	2,664	1,949	15	700	7,462
West	2,025	1,828	16	181	10,869
Panhandle	455	363	64	28	1,461
East	314	184	46	84	1,553
Gulf Coast	864	562	63	239	5,070
Southwest	1,068	822	37	209	3,761
Utah	10	6	1	3	46
West Virginia	281	41	192	48	647
Wyoming	277	197	5	75	1,369
Miscellaneous	3	1	0	2	17
Jan.-June 1955	21,856	14,860	1,466	5,530	82,024
Jan.-June 1954	20,653	13,821	1,671	5,161	80,781



Much of increase goes to storage as

Production Rises to 6.79 Million Barrels Daily

by John C. McCaslin
District Editor

PRODUCTION of crude oil and lease condensate for the first half of 1955 averaged 6,793,100 bbl. per day, up 341,200 bbl. over the corresponding 1954 period.

Second-quarter average production for this year is up 231,000 bbl. per day over the same period last year. First-quarter 1955 output was up 452,000 bbl. per day, or 7.1 per cent over the same period last year.

The increase in first-half production should not be a rule for forecasting production for the last 6 months of 1955. The volume gain in production over last year was about 61,750,000 bbl. The major factor in this increase was the amount of crude that was placed in storage. Crude stocks had dropped to 258,000,000 bbl. by the first of January 1955. By the end of June these stocks had climbed back to 274,000,000 bbl., or within the normal range. Thus, about 26 per cent of the total crude-production increase went into tanks to replace the oil taken out during the last 5 months of 1954. About 22,000,000 bbl. of the January-June production should have been producing during the last 6 months of last year.

May allowables . . . May production-allowable cuts, particularly in Texas, caused a drop of about 150,000 bbl. per day for crude production.

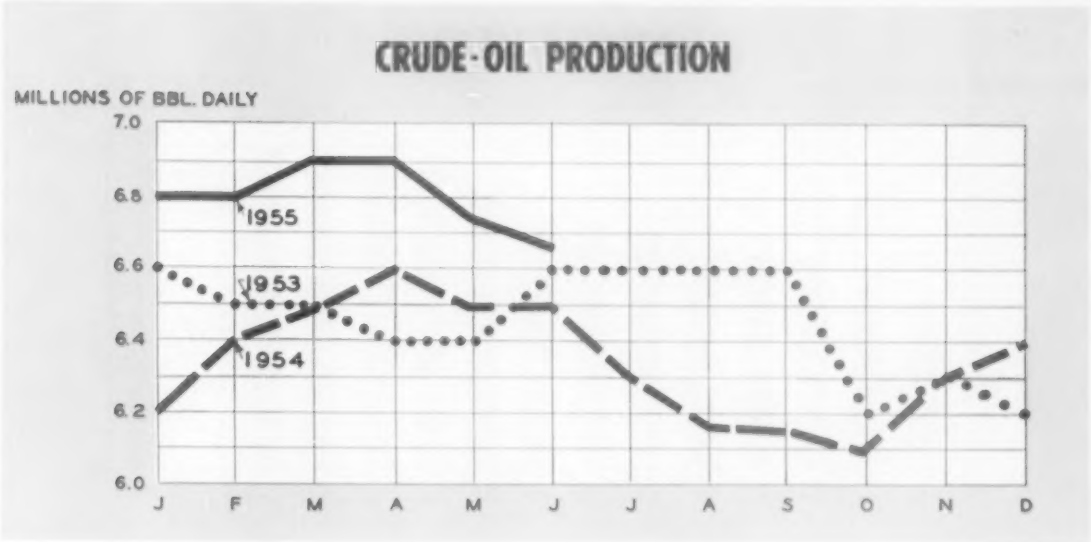
This decrease put the brakes on crude-inventories additions, but the peak stock level was not reached until near the end of the month. A big gain in refinery runs starting in the third week of May caused a reversal of the crude-stock trend. Runs went on up in June. This high-level run increase will cause a drop in crude inventories, but product stocks will climb at a rate that will pressure product markets. During the last half of 1955 there will be no need for any further additions to crude inventories. Thus, the crude output for the last half should be fitted to demand expectations.

The Production Story

At its usual top place on the production scale was Texas. That biggest of all producers netted an average of about 2,953,900 bbl. per day. First-half oil production in Texas reached its high in March with an average of 2,972,950 bbl. per day. The production increase in Texas (212,400 bbl. over the 1954 period) was due to the low production rate set during the first half of last year. Texans blame their production troubles on imports.

California . . . The Golden State continued its historic second place notch with a daily average of 971,300 bbl. This is a drop of 18,000 bbl. from the 1954 figure. During 1954 and the first part of this year California failed to reach the million-barrel per day mark that was set in 1953 and January 1954. The status quo of California production during the first half was due to low development programs over-all and a slack in demand for heavy crude. Washington State refineries are now being supplied by light Alberta crude. California wildcatting is expected to step up its search for higher-gravity oil in the next few months. Most of California's new top-grade reserves have been tapped in recent months as a result of an intensified deep play in and around the older producing areas of the San Joaquin Valley.

Louisiana . . . The Pelican State remained in third place with daily average production at 713,600 bbl. The high production mark for the period was set during the week



of May 28. Production during that period hit a high of 729,700 bbl. Of this, 614,000 bbl. was along the Louisiana Gulf Coast. Louisiana production was up because of high development programs and high-success ratio of discoveries along the Gulf Coast.

Oklahoma . . . This fourth-from-the-top producer reported a gain in daily average crude-oil output. Daily production for the first half was 549,100 bbl. Some of the market for Oklahoma and Kansas crude is being replaced by Rocky Mountain and Illinois crude . . . thus no great change in Mid-Continent province output.

Rocky Mountain . . . Wyoming continued to increase its daily production with 273,500 bbl. of oil per day, compared to 251,400 bbl. per day last year. Colorado and western Nebraska production was also up over the previous year as more and more oil was placed into the pipelines leading out of the mountain country into midwestern refinery centers.

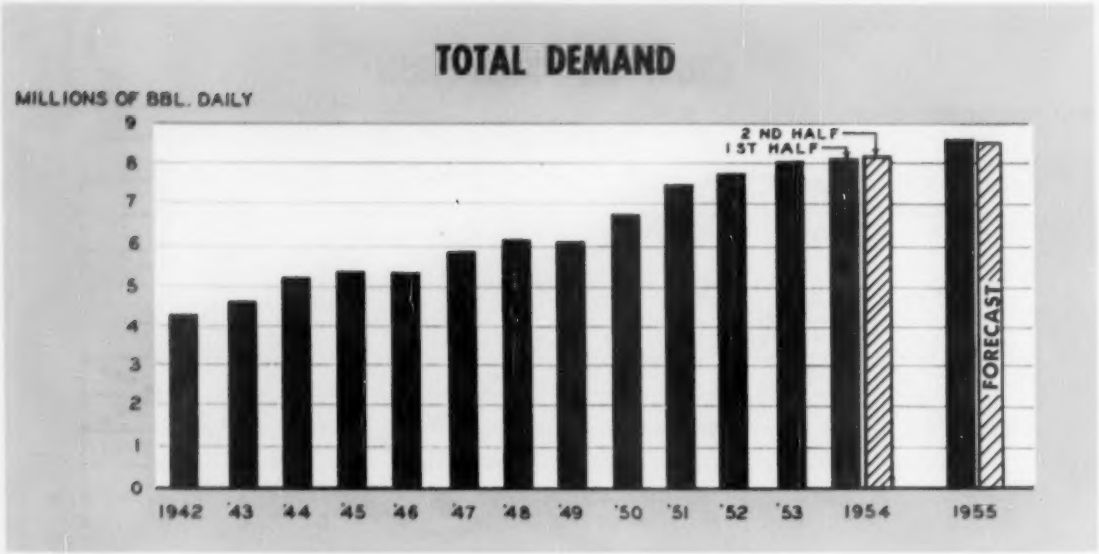
The crude market in the Rocky Mountain province kept steady during the first half. It appears that crude-oil production in Wyoming this year will reach a new all-time high. Current trends point to more than 100,000,000 bbl. for that state this year.

Eastern interior . . . Illinois production for the first half was 219,300 bbl., the highest production attained in the state since 1943. Indiana was down to 29,000 bbl. compared to 1954's 31,700. Western Kentucky production soared to 39,400 bbl. per day compared to 37,200 last year.

United States Crude-Oil Production—First Half Year

(Thousands of barrels daily)

	1955	1954	1953	1952	1951	1950	1949	1948	1947	1946	1945
Alabama	3.5	4.5	4.7	2.7	2.8	1.6	1.2	1.3	1.0	1.1	0.4
Arkansas	77.1	81.4	81.0	80.2	81.7	85.8	84.8	85.7	80.2	77.0	80.1
California	971.3	989.3	998.1	980.0	964.9	866.6	938.2	940.2	903.6	854.8	916.0
Colorado	128.6	106.4	95.3	80.8	76.7	60.3	63.7	45.7	38.5	27.5	10.5
Florida	1.3	1.5	1.5	1.7	1.6	1.1	1.3	0.8	0.5	0.2	0.1
Illinois	219.3	178.4	160.7	164.1	166.3	169.4	175.5	174.0	185.9	208.5	207.1
Indiana	29.0	31.7	35.6	31.5	28.0	28.9	24.3	17.2	17.1	18.7	13.1
Kansas	331.1	328.7	328.9	296.4	309.4	286.2	288.0	297.1	280.7	257.6	268.7
Kentucky	39.4	37.2	30.6	34.4	29.0	26.5	23.2	24.1	25.3	29.7	27.4
Louisiana	713.6	706.0	708.5	645.6	632.9	547.3	520.8	483.0	424.1	379.7	356.9
Michigin	31.9	33.5	33.9	37.1	39.3	44.7	44.6	44.9	42.8	47.2	48.2
Mississippi	95.7	93.2	99.4	99.8	102.4	101.0	108.5	120.2	88.4	57.8	51.1
Montana	44.5	34.5	30.9	23.7	24.4	21.8	25.8	24.8	23.2	24.8	23.3
Nebraska	25.1	19.4	16.2	6.2	7.6	2.3	0.6	0.6	0.6	0.9	0.9
New Mexico	223.9	202.0	187.3	150.9	140.3	126.6	132.9	128.1	105.6	99.1	104.3
New York	8.0	9.1	10.7	11.7	11.6	11.5	12.3	12.7	13.0	13.4	12.5
North Dakota	27.0	14.4	14.6	1.2							
Ohio	11.2	10.9	9.4	9.0	8.8	9.3	9.6	9.5	8.1	8.0	7.7
Oklahoma	549.1	536.6	558.4	507.1	504.2	417.8	419.1	411.3	375.7	375.1	376.7
Pennsylvania	22.4	26.4	29.5	31.3	31.8	31.8	32.1	34.9	34.6	35.6	34.7
Texas	2,953.9	2,741.5	2,836.3	2,722.9	2,695.3	2,034.8	2,106.8	2,427.0	2,146.0	2,055.3	2,161.8
Utah	5.6	5.3	5.2	4.3	3.5	3.2	0.8				
West Virginia	6.5	8.2	7.5	7.1	7.5	7.9	7.5	7.2	6.9	8.3	8.0
Wyoming	273.5	251.4	213.5	175.4	190.2	159.8	127.1	145.9	116.1	105.6	102.7
Miscellaneous	0.6	0.4	0.2	0.2	0.2	0.2	0.3	0.2	0.4	0.2	0.1
Total United States	6,793.1	6,451.9	6,497.9	6,105.3	6,060.4	5,046.4	5,149.0	5,436.4	4,918.3	4,686.1	4,812.3



Most published forecasts being exceeded

Demand for '55 Will Top 8½ Million Barrels

by John C. Casper

DEMAND for petroleum products in the first quarter of this year exceeded all published forecasts for the period, and current estimates for the second quarter, based on weekly data, are topping most of the first-of-the-year projections.

Total demand for all crude and products averaged 9,232,000 bbl. daily for the first 3 months of the year for a gain of 640,000 bbl. daily or 7.4 per cent over the same months in 1954. The outlook is for relatively high percentage gains in the other months of 1955. Demand for the year should average about 8,579,000 bbl. daily.

The most influential factor in these large percentage gains is the fact that near-normal demand in the current year is being compared with abnormally low demand in 1954.

For the period from 1946 through 1954, the average annual increase in total demand was 5.4 per cent. But in the early years of the period part of the demand gain was due to the backlog built up during World War II.

Demand in 1952 was 3.2 per cent more than in 1951, and a further increase of 3.8 per cent was recorded in 1953. The small gain of 1.3 per cent in 1954 left an abnormally low base on which to calculate percentage increases in 1955. The gain of 5.8 per cent for this year will serve to bring demand back nearer to the trend line of the postwar period. If the increase for 1955 is combined with the small gain in 1954, the average is about 3.6 per cent per year. This is in line with other gains since 1951.

Percentage gains over the corresponding quarters of 1954 decrease progressively throughout this year. Demand in the first quarter was up 7.4 per cent over the first quarter of 1954. Most of this gain was due to near-normal heating weather this year compared with warm weather in 1954. Demand in the first quarter of 1954 was only 1 per cent more than in 1953.

Current figures for the second quarter of this year indicate that demand may have been slightly below normal. Total demand was up only about 6.1 per cent from last year, and demand in the second quarter of last year was very low, 2.2 per cent less than in 1953. A normal increase for the second quarter of this year would have been about 7.5 per cent.

Demand for the third quarter is expected to be up 5.3 per cent over last year, followed by an increase of 4.4 per cent in the last quarter.

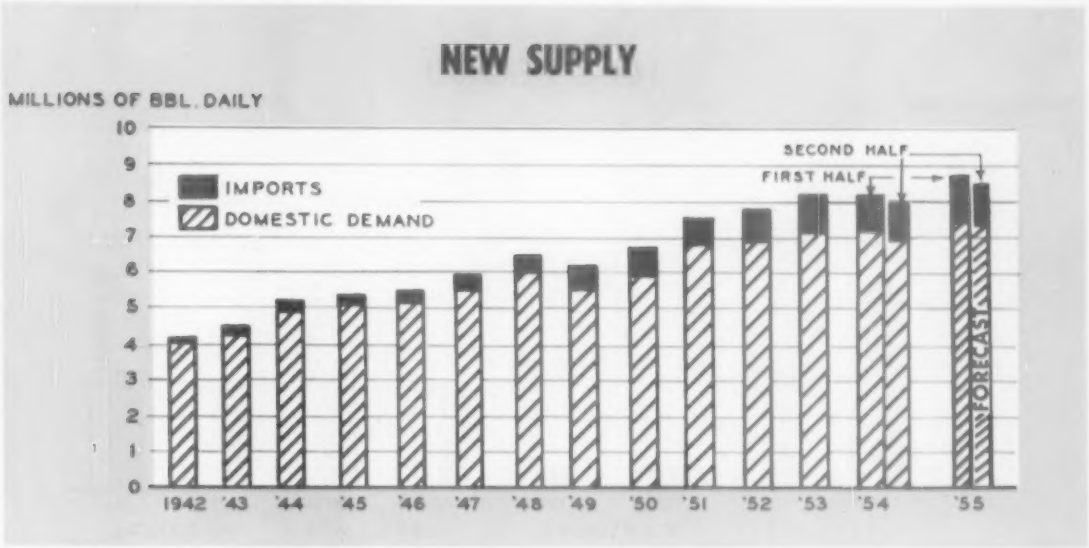
Exports of crude and products in the first quarter averaged more than a year earlier, but decreases are expected for the other three quarters of the year. The decrease for the year is projected at 11.5 per cent. This drop in exports held the total demand gain to 5.8 per cent compared with 6.6 per cent for domestic demand.

By products, the largest percentage gain this year is forecast for distillate fuels. This is due to the weather differential in the first quarter and to a forecast based on near-normal weather for the fourth quarter.

Demand for kerosene has been slipping in recent years. Total demand this year will be about the same as in 1948 and down about 5.3 per cent from last year.

The deviation from the residual-demand trend this year is not expected to continue. Total demand for residual in 1954 was less than for any year since 1949. The shift came in the first quarter of this year when residual demand was at an all-time high. Increased demand for heavy fuel this year is related to the rapid industrial growth. Total industrial production for the first 4 months of this year was up about 8 per cent over last year.

While industrial production is expected to remain

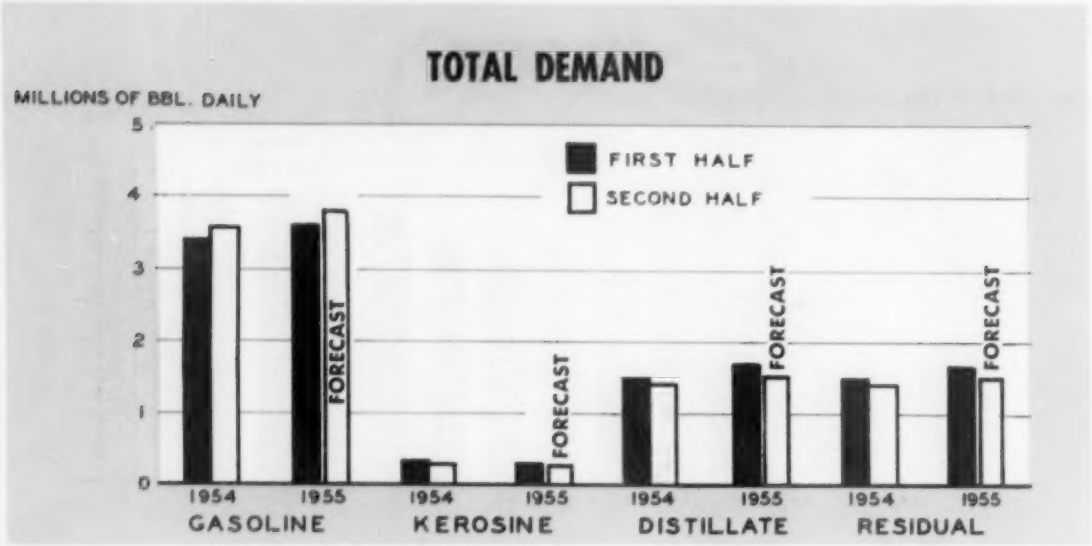


1955 Supply and Demand by Quarters*

(Thousands of barrels daily)

	First quarter		Second quarter		Third quarter		Fourth quarter		Year 1955	
	Volume	Per cent inc. over 1954	Volume	Per cent inc. over 1954	Volume	Per cent inc. over 1954	Volume	Per cent inc. over 1954	Volume	Per cent inc. over 1954
DOMESTIC DEMAND	**8,892**	**7.6**	**7,738**	**7.4**	**7,672**	**5.9**	**8,760**	**5.5**	**8,264**	**6.6**
Gasoline	3,228	4.6	3,799	7.6	3,780	6.3	3,500	3.1	3,578	5.5
Kerosine	478	— 2.2	149	—16.8	167	—13.0	450	2.5	310	— 4.3
Distillate	2,228	10.5	1,115	7.7	1,070	11.0	1,950	10.7	1,589	10.2
Residual	1,764	6.4	1,398	7.0	1,290	6.5	1,610	3.9	1,514	5.9
Lubricants	108	4.8	117	9.3	115	4.5	115	13.9	114	8.6
Jet fuel	148	33.3	145	23.9	150	5.6	155	17.4	150	19.0
Other†	938	17.4	1,015	9.6	1,100	2.8	980	5.6	1,009	8.3
EXPORTS	**340**	**2.7**	**319**	**—19.0**	**313**	**— 6.8**	**290**	**—20.3**	**315**	**—11.5**
Gasoline	81		80	—21.6	90	— 7.2	80	—18.3	83	—11.7
Kerosine	9	—55.0	7	—50.0	8	—20.0	10		9	—30.8
Distillate	54		46	—37.8	50	—12.3	50	—37.5	50	—24.2
Residual	104	40.5	85	7.6	60	—14.3	60	—15.5	77	4.1
Lubricants	37	— 2.6	40	—16.7	45	9.8	40		40	— 4.7
Jet fuel										
Other products	31	10.7	31	— 6.1	35	20.7	25	—13.8	30	
Crude	24	—33.3	30	—31.8	25	—21.9	25	—30.6	26	—29.7
TOTAL DEMAND	**9,232**	**7.4**	**8,057**	**6.1**	**7,985**	**5.3**	**9,050**	**4.4**	**8,579**	**5.8**
Gasoline	3,309	4.5	3,879	6.8	3,870	5.9	3,580	2.5	3,661	5.0
Kerosine	487	— 4.3	156	—19.2	175	—13.4	460	2.5	319	— 5.3
Distillate	2,282	10.2	1,161	4.7	1,120	9.7	2,000	8.6	1,639	8.7
Residual	1,868	7.9	1,483	7.0	1,350	5.4	1,670	3.1	1,591	5.8
Lubricants	145	2.8	157	1.3	160	6.0	155	9.9	154	4.8
Jet fuel	148	33.3	145	23.9	150	5.6	155	17.4	150	19.0
Other†	993	15.1	1,076	7.3	1,160	2.6	1,030	3.7	1,065	6.6
STOCK CHANGE	**—317**		**500**		**350**		**—350**		**46**	
Crude	67		106		30		— 30		43	
Products	—384		394		320		—320		3	
NEW SUPPLY	**8,915**	**9.1**	**8,557**	**4.8**	**8,335**	**6.4**	**8,700**	**6.7**	**8,625**	**6.8**
IMPORTS	**1,348**	**22.5**	**1,109**	**13.7**	**1,080**	**9.9**	**1,240**	**7.9**	**1,193**	**13.4**
Crude	744	17.9	725	14.0	750	9.2	750	12.1	742	13.1
Products	604	28.8	384	13.3	330	11.5	490	2.1	451	13.9
PRODUCTION	**7,567**	**7.1**	**7,448**	**3.6**	**7,255**	**5.9**	**7,460**	**6.4**	**7,432**	**5.8**
Crude	6,827	7.1	6,759	3.5	6,555	5.8	6,710	6.7	6,712	5.8
Natural gasoline, etc.	740	6.8	689	4.4	700	6.9	750	4.6	720	5.8
CRUDE RUNS TO STILLS	**7,430**	**6.5**	**7,304**	**5.3**	**7,205**	**4.3**	**7,420**	**5.8**	**7,339**	**5.5**

*First quarter actual, part of second quarter estimated, and last half forecast. †Includes crude and refinery loss.



at a high level, the percentage gains in 1956 will not equal the gains of 1955. Also, there is a definiite trend toward lower yields of residuals at refineries in this country so that, even with increases in refinery runs each year, residual production will not gain and may decrease. Any continuing gain in demand would have to be supplied by imports, and yield trends at refineries outside this country are toward greater production of the higher-priced products.

Total demand for gasoline this year will be up about 5.0 per cent with domestic demand gaining 5.5 per cent. The high level of motor-vehicle sales, projected for this year, will produce good gasoline demands in 1956.

Big New Supply Increase

Total new supply will increase more this year than total demand. Almost 11,000,000 bbl. of the 1954 demand was met from stocks already in storage at the first of the year. Additions to crude storage this year will be larger than the small gain needed in product stocks. The total stock increase is expected to be about 17,000,000 bbl.

This increase in stocks for 1955, in contrast with the reduction in 1954, accounts for the increase of 6.8 per cent in new supply compared with the 5.8 per cent gain by total demand.

Estimates of imports for the second and third quarters are based on company reports to the Texas Railroad Commission. Fourth-quarter crude imports are projected at the same rate indicated for the third quarter.

Crude production in the first quarter gained 7.1 per cent, but much of this increase was due to the need to rebuild crude stocks that were depleted in the last quarter of 1954. Low production levels in the third and fourth quarters of last year were the bases from which production increases of 5.8 per cent and 6.7 per cent are forecast for the last two quarters of this year.

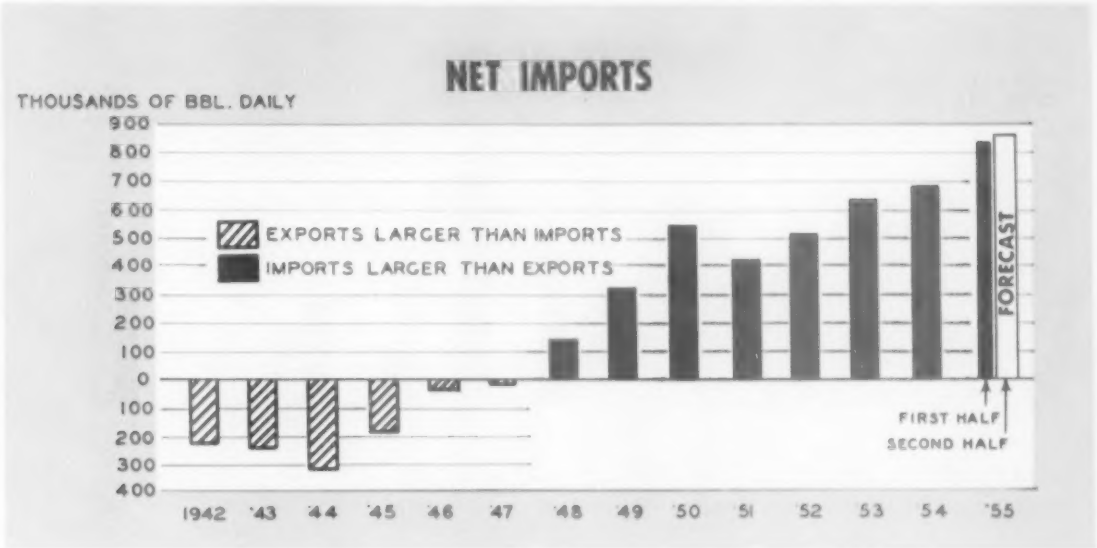
Refinery runs in excess of 7,400,000 bbl. daily will be needed to met product demands in the last quarter of this year. Further gains to about 7,675,000 bbl. daily are forecast for the first quarter of 1956.

Total demand for the first quarter of next year is expected to average 9,475,000 bbl. daily. Colder-than-normal weather would push the total past the 9,500,000-bbl. mark. The expected demand will call for crude production of almost 6,950,000 bbl. daily.

SUPPLY AND DEMAND IN HEATING SEASON
(Thousands of barrels daily)

	First quarter 1956		Six months ending March 31, 1956	
	Forecast	% inc.	Forecast	% inc.
DOMESTIC DEMAND	**9,175**	**3.2**	**8,972**	**4.4**
Gasoline	3,350	3.8	3,430	3.6
Kerosine	470	— 1.7	460	0.4
Distillate	2,360	5.9	2,155	8.2
Residual	1,785	1.2	1,697	2.5
Lubricants	105	— 2.8	110	5.8
Jet fuel	155	4.7	155	10.7
Other*	950	1.3	965	3.4
EXPORTS	**300**	**—11.8**	**295**	**—16.2**
Gasoline	80	— 1.2	80	—11.1
Kerosine	10	1.1	10	
Distillate	50	— 7.4	50	—25.4
Residual	70	—32.7	65	—25.3
Lubricants	40	8.1	40	2.5
Jet fuel				
Other products	25	—19.4	25	—16.7
Crude	25	4.2	25	—16.7
TOTAL DEMAND	**9,475**	**2.6**	**9,267**	**3.6**
Gasoline	3,430	3.7	3,510	3.2
Kerosine	480	— 1.4	470	0.4
Distillate	2,410	5.6	2,205	7.1
Residual	1,855	— 0.7	1,762	1.1
Lubricants	145		150	4.9
Jet fuel	155	4.7	155	10.7
Other*	1,000	0.7	1,015	2.2
STOCK CHANGE	**—450**		**—405**	
Crude	— 50		— 40	
Products	—400		—365	
NEW SUPPLY	**9,025**	**1.2**	**8,862**	**3.9**
IMPORTS	**1,310**	**— 2.8**	**1,275**	**2.2**
Crude	750	0.8	750	6.2
Products	560	— 7.3	525	— 3.0
PRODUCTION	**7,715**	**2.0**	**7,587**	**4.2**
Crude	6,945	1.7	6,827	4.2
Natural gasoline, etc.	770	4.1	760	4.2
CRUDE RUNS TO STILLS	**7,675**	**3.3**	**7,547**	**4.5**

*Includes crude and refinery loss.



Crude Imports Set Record in First Quarter

IMPORTS of foreign crude averaged 744,000 bbl. daily for the first quarter of this year to set a new all-time record for any 3-month period. Preliminary weekly figures indicate an average of about 725,000 bbl. daily during the second quarter, and unless importing-company plans call for sharp reductions in the last quarter of the year, the average for the last half will be about 750,000 bbl. daily.

In the breakdown of crude imports by country of origin, as compiled by the Department of Commerce, Venezuela accounted for more than half of the net increase for the first 4 months of this year. The average for all crude imports was up 98,300 bbl. daily over the first 4 months of 1954. The gain for Venezuela was 51,700 bbl. daily.

The second largest gain was in crude from Kuwait. Gains by Canadian crude ranked third. Crude supplies for the new refineries in Washington accounted for most of the increase in receipts from Canada.

Product imports also set a new record in the first quarter with an average of 604,000 bbl. daily. In the 4-year period from 1951 through 1954, product imports ranged from 439,000 bbl. daily to 469,000 bbl. daily. This level of product imports was related to the near-static demand for residual fuel during those years.

Total demand for residual in the first quarter of 1955 was up 7.9 per cent over the same period of 1954. An increase in imports was required to meet this demand. Production of residual fuel by refiners in this country was less than in the first quarter of 1954 despite an increase of 6.5 per cent in refinery runs.

If demand for residual returns to its normal postwar trend, product imports for the coming winter will be less than the average for last winter.

Total exports in the first quarter averaged more than in the same quarter last year, but the total for the year is expected to drop about 11.5 per cent under 1954. Data on exports by quarters are included in the demand forecast.

IMPORTS INTO CONTINENTAL UNITED STATES
(Thousands of barrels daily)

	Jan.-June 1955*	Jan.-June 1954	Change	Per cent change
Crude	734.5	633.7	100.8	15.9
Residual fuel	449.8	365.6	84.2	23.0
Other oils	43.2	38.2	5.0	13.1
Total	1,227.5	1,037.5	190.0	18.3

EXPORTS
(Thousands of barrels daily)

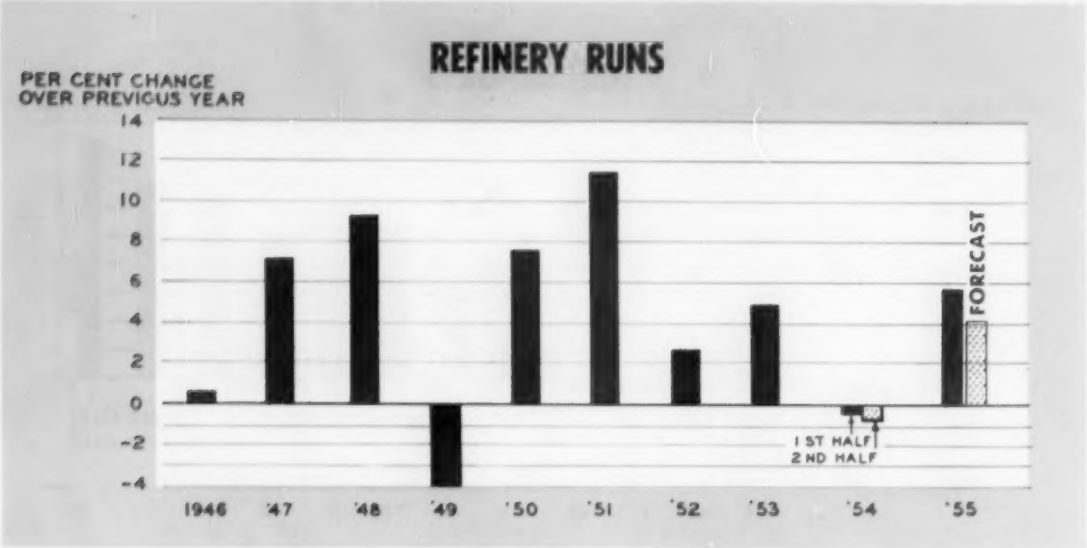
	Jan.-June 1955*	Jan.-June 1954	Change	Per cent change
Crude	26.8	40.4	—13.6	—33.7
Gasoline	80.3	91.4	—11.1	—12.1
Kerosine	8.2	16.6	— 8.4	—50.6
Distillate fuel	49.9	64.2	—14.3	—22.3
Residual fuel	94.6	76.8	17.8	23.2
Lube oils	38.7	42.8	— 4.1	— 9.6
Other oils	30.6	30.4	0.2	0.6
Total	329.1	362.6	—33.5	— 9.2

*Four months actual, two months estimated.

CRUDE IMPORTS BY COUNTRY OF ORIGIN*
(Thousands of barrels daily)

	Jan.-Apr. 1955	Jan.-Apr. 1954	Change	Per cent change
Mexico	20.8	14.3	6.5	45.5
Colombia	23.8	41.5	—17.7	—42.7
Venezuela	392.6	340.9	51.7	15.2
Peru	3.0		3.0	
Trinidad		0.9	— 0.9	
Ecuador		0.8	— 0.8	
Kuwait	125.3	86.3	39.0	45.2
Saudi Arabia	80.2	80.4	— 0.2	— 0.2
Neutral Zone	9.6	4.8	4.8	100.0
Iraq	10.5	8.3	2.2	26.5
Qatar	6.7	9.0	— 2.3	—25.6
Canada	24.4	5.5	18.9	343.6
Far East	29.8	35.7	— 5.9	—16.5
Total	726.7	628.4	98.3	15.6

*U. S. Department of Commerce.



Coke production up 21.7 per cent

Refinery Runs Up; Less Kerosine and Resid

REFINERS ran almost 6 per cent more crude in the first half of the year than in the first 6 months of 1954 but made less kerosine and residual fuel. However, the reasons for the shifts in yields differed.

Total demand for kerosine was less than in 1954. Kerosine demand for the first half is estimated at 321,000 bbl. daily compared with 350,000 bbl. daily for the same period in 1954. Production figures in the accompanying table show that kerosine production in the postwar period has not increased in proportion to over-all refinery operations. Some of the drop since 1952 has been due to separate reporting of jet fuel. For 1952 and earlier years, kerosine material blended into jet fuel was shown as kerosine production.

The drop in residual production this year was not due to any lack of demand for heavy fuel but to shifts in operations to improve total realization from a barrel of crude. Total demand for resid in the first half averaged 1,674,000 bbl. daily compared with 1,558,000 bbl. daily for the first 6 months of 1954.

Increased use of cokers is indicated by a gain in coke production during the first 4 months amounting to 21.7 per cent. Also, more of the heavy material is going into asphalt. Refinery production of asphalt and road oil was up 11.2 per cent in the first 4 months.

The Gulf Coast areas of Texas and Louisiana accounted for most of the increase in refinery runs in the first half of the year. The total increase in runs amounted to 412,000 bbl. daily with 240,000 bbl. daily of the gain reported by Gulf Coast refineries of Texas and Louisiana. These areas ran 33.6 per cent of all crude processed but accounted for 58.3 per cent of the increase in runs.

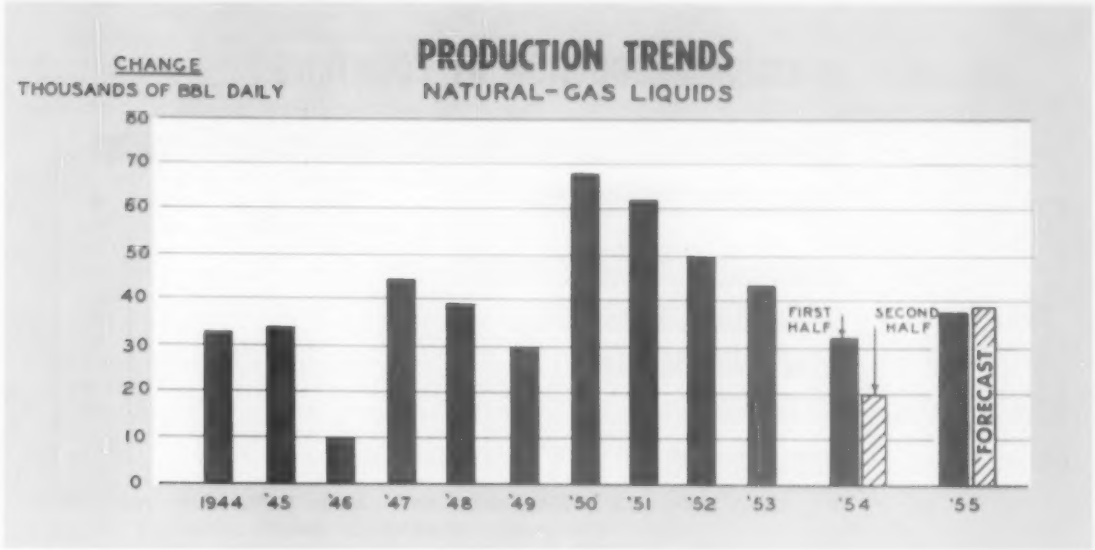
The volumetric gain in District 2 refinery runs was almost equally divided, with a gain of 65,000 bbl. daily in the Illinois-Indiana-Kentucky portion and 62,000 bbl. daily for the Oklahoma-Kansas-Missouri area. East Coast runs gained 2.7 per cent, and the West Coast increased only 0.6 per cent.

REFINERY RUNS BY DISTRICTS—JANUARY-JUNE
(Thousands of barrels daily)

				Per cent change 1955 over	
	1955	1954	1953	1954	1953
East Coast	1,052	1,024	1,043	2.7	0.9
Appalachian:					
District 1	96	108	108	—11.1	—11.1
District 2	91	90	91	1.1	
Ill., Ind., Ky.	1,353	1,288	1,246	5.0	8.6
Okla., Kans., Mo.	653	591	580	10.5	12.6
Texas:					
Inland	255	245	264	4.1	—3.4
Gulf Coast	1,829	1,672	1,738	9.4	5.2
La. Gulf Coast	645	562	548	14.8	17.7
N. La. and Ark.	87	87	85		2.4
Rocky Mountain:					
New Mexico	20	19	19	5.3	5.3
Other Rocky Mtn.	248	237	229	4.6	8.3
California	1,038	1,032	1,029	0.6	0.9
Total U. S.	7,367	6,955	6,989	5.9	5.5

REFINERY RUNS AND PRODUCT OUTPUT
(Thousands of barrels daily)

	Runs	Gasoline	Kerosine	Distillate	Residual
1947	5,075	2,235	303	855	1,227
1948	5,549	2,446	333	1,048	1,274
1949	5,326	2,572	280	934	1,164
1950	5,739	2,735	325	1,093	1,165
1951	6,494	3,037	372	1,304	1,286
1952	6,670	3,160	361	1,422	1,240
1953	7,000	3,381	338	1,447	1,233
1954					
First half	6,955	3,339	347	1,434	1,182
Last half	6,961	3,417	324	1,536	1,103
1955					
First half	7,367	3,527	339	1,662	1,167



Natural-Gas Liquids Up 5½ Per Cent

PRODUCTION at natural-gasoline and cycling plants averaged about 712,400 bbl. daily for the first half of the year for an increase of 5.5 per cent over the same period of 1954. About the same rate of increase over last year is expected during the last half.

Plant production of L.P.G. was up 8.6 per cent for the first half, but the rate of gain was the lowest first-half increase in several years. Also, there is some indication that the percentage gain for L.P.G. may be dropping back a little nearer to the over-all gain in plant production. For example, the percentage gains in L.P.G. production for both halves of 1954 were more than twice the gains in total plant production. For the first half of this year the 8.6 per cent gain for L.P.G. was only 1.6 times the 5.5 per cent increase in total output.

Refiners blended about 3,000,000 bbl. more natural-gas liquids into motor fuel during the first 4 months of the year than in the same months of 1954. Also, the Bureau of Mines reported that domestic consumption of L.P.G. from plants increased 5,900,000 bbl. for the same periods.

L.P.G. prices dropped early in the year under pressure of relatively large inventories in underground storage, but high demand for L.P.G. during the first quarter tended to stabilize the market.

The Group 3 price for Grade 26-70 natural started the year at 5.5 cents per gallon but dropped to 4.5 cents before the end of February. Better motor-fuel demand in the Group 3 area pushed natural prices up 0.5 cent by the end of June.

PRODUCTION AT NATURAL-GASOLINE AND CYCLING PLANTS BY YEARS
(Thousands of barrels daily)

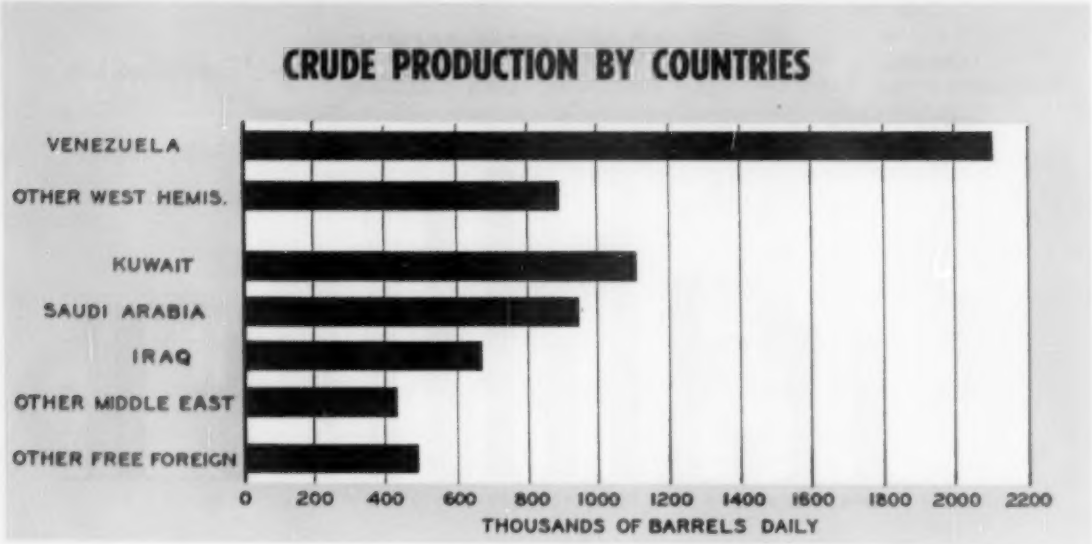
	L.P.G.‡	Natural gaso.‡	Other	Total	—Per cent inc.— Total	L.P.G.
1942	50.5	135.1	42.7	228.3	3.0	9.5
1943	59.4	138.0	42.9	240.3	5.3	17.6
1944	76.1	142.4	54.8	273.3	13.7	28.1
1945	84.8	170.4	51.7	306.9	12.3	11.4
1946	89.6	177.9	49.6	317.1	3.3	5.7
1947	120.8	181.6	59.7	362.1	14.2	34.8
1948	140.0	197.5	63.3	400.8	10.7	15.9
1949	155.2	199.7	75.5	430.4	7.4	10.9
1950	195.2	213.4	90.0	498.6	15.8	25.8
1951	232.4	234.1	94.5	561.0	12.5	19.1
1952	272.5	244.7	93.4	610.6	8.8	17.2
1953						
First half	296.3	250.1	96.6	643.0	7.7	10.0
Second half	306.4	262.7	95.0	664.1	6.4	11.2
1954						
First half	326.2	262.8	86.1	675.1	5.0	10.1
Second half	325.6	271.6	87.2	684.4	3.1	6.3
1955						
First half*	354.2	274.1	84.1	712.4	5.5	8.6
Second half†	355.0	282.0	86.0	723.0	5.6	9.0

*Four months actual, two months estimated. †Forecast. ‡Isopentane included in natural gasoline, starting with 1945.

PRODUCTION AT NATURAL-GASOLINE AND CYCLING PLANTS—JANUARY-JUNE
(Thousands of barrels daily)

	1955* L.P.G.	Natural gaso.†	Other	Total	Total Jan.-June 1954
Pennsylvania	0.1	0.3		0.4	0.4
West Virginia-Ohio	8.7	2.5		11.2	15.1
Illinois-Michigan	16.1	1.6	0.1	17.8	17.7
Kansas-Nebraska	8.9	9.1		18.0	14.7
Kentucky	12.5	2.4		14.9	14.0
Oklahoma	29.4	30.2	0.3	59.9	56.4
Arkansas	3.5	2.9	0.4	6.8	7.2
Louisiana	17.9	17.1	29.7	64.7	61.8
Gulf	7.1	10.6	10.4	28.1	27.3
Inland	10.8	6.5	19.3	36.6	34.5
Mississippi	0.9	1.3	0.4	2.6	2.9
New Mexico	17.2	15.1	0.1	32.4	25.7
Texas	205.5	136.7	47.8	390.0	366.7
Gulf	32.2	30.9	18.9	82.0	76.0
West Texas	61.3	62.0	0.2	123.5	105.9
East Texas	17.7	11.3	0.4	29.4	29.7
Panhandle	57.5	3.7	0.4	61.6	60.4
Other Texas	36.8	28.8	27.9	93.5	94.7
Rocky Mountain	6.0	4.2		10.2	8.5
California	27.5	50.7	5.3	83.5	84.0
Total U. S.	354.2	274.1	84.1	712.4	675.1

*Four months actual, two months estimated. †Includes isopentane.



Free World production up 10.1 per cent

Foreign Output Still Outgains That of U. S.

by Ray G. Gibson
District Editor

FOREIGN crude production, exclusive of Russia and other Communist areas, increased 15.5 per cent during the first 6 months of 1955 over the same period last year.

Foreign output reached an all-time high average of 6,661,900 bbl. daily the first half of this year, against 5,766,200 bbl. daily in 1954.

The Free World as a whole had a 6-month average of about 13,455,000 bbl. daily, also an all-time high. This was up 1,236,000 bbl. daily, or 10.1 per cent, over the first 6 months of 1954. The Free World rise compares with a gain of 4.1 per cent between the first halves of 1953-54, and a 6.8 per cent rise between the same period of 1952-53.

The gain of 15.5 per cent in foreign production compared to an over-all Free World gain of 10.1 per cent is a continuation of the long-term trend of greater gains abroad than in the United States. For the first time on a half-year basis, foreign output nearly matched domestic crude production.

Output in the United States during the first 6 months reached the record level of about 6,793,100 bbl. daily. This is a 5.3 per cent rise over the 6,451,900 bbl. daily production during the same period last year. From the first half of 1948 to midyear 1955 output has risen 25 per cent in the United States. In the same number of years, foreign production, exclusive of Communist-dominated areas, has increased 128 per cent.

Besides foreign gains in output percentagewise, the actual year-to-year increase of barrels of oil brought to the surface has been substantially greater abroad than in the United States. Except for the 1950-51 period, the increase of barrels of crude produced abroad has been greater than in the United States for the past 6 years.

The increases, based on first half-year averages, in thousands of barrels daily, are as follows:

	Foreign areas, exclusive of Russia and other Communist areas	United States
1955-54	895.7	341.2
1954-53	523.0	—60.4
1953-52	353.5	302.9
1952-51	228.2	69.0
1951-50	787.2	1,007.6
1950-49	504.6	—102.6

As usual, the Middle East was the area with the greatest gain during the first 6 months of this year. The chief source of oil for Western Europe's expanding economy, the Middle East averaged an all-time high of about 3,168,700 bbl. daily during the first half of 1955. Output was up 515,000 bbl. daily, or 19.4 per cent, over the same period last year.

Iran again entered the international oil picture as a crude supplier with a half-year production average of 265,000 bbl. daily, against 42,400 bbl. daily last year. Output in Iran, however, still has a long way to go before reaching the records achieved before nationalization of the oil industry in June 1951. First half-year averages in both 1950 and 1951 for Iran were in the neighborhood of 660,000 bbl. daily.

Despite the resumption of production in Iran, it accounted for only slightly more than half of the Middle East increase. Both Kuwait and Iraq had an all-time high average for the 6-month period. Each area broke and rebroke previous monthly records in the course of the first half. Production in Kuwait, a 3,650-sq.-mile sheikhdom which is the Free World's third ranking crude producer, averaged 1,110,000 bbl. daily, up 23.7

per cent or 212,400 bbl. daily over the first half of 1954. Output in Iraq rose to an average of 670,000 bbl. daily during the first 6 months, up 10.1 per cent or 61,400 bbl. daily over last year. Much of the increase in Iraq's production was due to Basrah Petroleum Co.'s newly developed Rumaila oil field. This field augments the company's production from Zubair field. It is connected with Zubair's main-line pump station by a 20-mile, 12-in. pipeline.

The only Middle East producer which showed an apparent curtailment in output because of renewed Iranian operations was Saudi Arabia. Arabian American Oil Co., which produces all crude in the kingdom, predicts that Aramco's production in 1955 will probably be less than in 1954. The view is based on sales forecasts which indicate the normal growth of markets for Middle East crude during the next 2 years will not be great enough to offset expected production in Iran. Even so, Saudi Arabia production during the first 6 months of 1955 was off only 1 per cent from the first half of 1954, some 9,600 bbl. daily. The average production was about 956,000 bbl. daily.

Early this year, major Middle East producers followed a pattern of maintaining the level of production or increasing it from month to month. Later in spring, production in Saudi Arabia and Iran, in the dollar area, began to taper off at a time when producers in the sterling area were holding firm or raising production. This was attributed to the currency situation.

Largest Increase in Venezuela

Although the biggest gains in a single area were made in the Middle East, the individual foreign country registering the largest increase was Venezuela. Production there rose to a new record level of 2,105,000 bbl. daily during the period. Output was up 236,700 bbl. daily, or 12.7 per cent over the first half of last year. Developments during the first 6 months included completion of a 45-mile, $9,700,000 pipeline by Cia. Shell de Venezuela to carry Lake Maracaibo production to Palmarejo, and the opening of the $24,000,000 Tia Juana gas injection plant by Creole Petroleum Corp. The plant recycles about 137,000,000 cu. ft. of gas daily into Lake Maracaibo formations.

In Mexico, Pemex reported important gains in production during the first half of the year. High points of the government oil agency's expansion program included the opening of new and enlarged field processing facilities at Poza Rica field. At the midyear mark, work also virtually was completed on a pipeline to carry increased crude supplies to the Atzcapotzalco refinery at Mexico City. New facilities at the refinery scheduled to go on stream this summer, will increase its capacity from 52,000 bbl. daily to 84,000 bbl.

In Canada, production averaged approximately 317,000 bbl. daily during the first 6 months of 1955. The level of output was up 83,700 bbl. daily, or 35.9 per cent, over 1954 and up 132,500 bbl. daily, or about 72 per cent over 1953.

Elsewhere in the Western Hemisphere gains were registered by Brazil, Ecuador, and Bolivia. Although these countries produce less than 10,000 bbl. daily at the present time, increases in domestic production help ease their national economies.

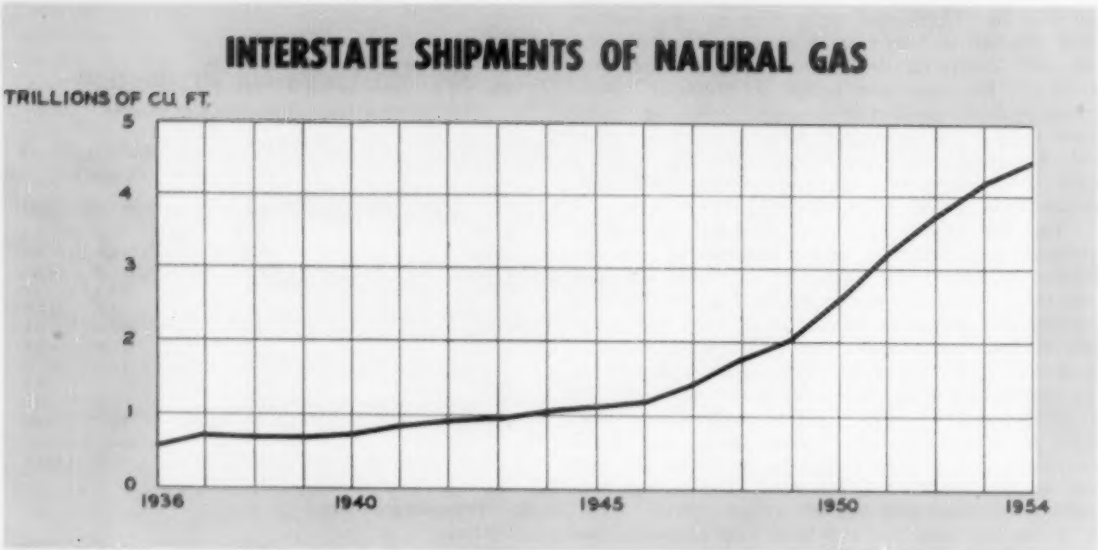
In the Western Europe and North Africa area, half-year production averages were up in France, West Germany, Italy, and the Netherlands. West Germany, which is conducting intensive exploration and development work, made the greatest gains. Production increased nearly 10,000 bbl. daily over the first half of last year to a new high of 59,000 bbl. daily.

World Crude-Oil Production

(Daily average in thousands of barrels)

	—First 6 mos.— 1955	1954	Per cent change	First 6 mos. 1953
Western Hemisphere:				
Argentina	80.4	80.4		76.7
Bolivia	6.5	3.8	71.0	1.3
Brazil	5.5	2.1	161.9	2.6
Canada	317.0	233.3	35.9	184.5
Chile	6.0	4.5	33.3	3.1
Colombia	104.0	116.4	—10.6	108.9
Cuba	0.6	0.1	500.0	0.1
Ecuador	9.5	8.5	11.8	8.0
Mexico	250.0	227.0	10.1	197.0
Peru	47.3	47.3		43.4
Trinidad	67.4	63.7	5.8	60.9
Venezuela	2,105.0	1,868.3	12.7	1,744.9
Total	2,999.2	2,655.4	12.9	2,431.4
Western Europe and North Africa:				
Algeria	1.2	1.6	—25.0	1.7
France	12.3	7.6	61.8	7.0
French Morocco	2.2	2.5	—12.0	2.1
West Germany	59.0	49.1	20.2	39.9
Italy	2.9	1.6	81.3	1.9
Netherlands	19.5	17.2	13.4	14.6
Egypt	33.3	38.0	—12.4	46.4
United Kingdom	1.2	1.2		1.1
Total	131.6	118.8	10.8	114.7
Middle East:				
Bahrain	30.1	30.1		30.1
Iran	265.0	42.4	525.0	26.0
Iraq	670.0	608.6	10.1	560.4
Kuwait	1,110.0	897.6	23.7	840.0
Neutral Zone	24.0	10.8	122.2	
Qatar	111.0	98.0	13.3	83.7
Saudi Arabia	956.6	965.6	—1.0	834.5
Turkey	2.6	0.6	333.3	0.4
Total	3,168.7	2,653.7	19.4	2,375.1
Other Asia:				
British Borneo	99.0	100.2	—1.2	99.7
Burma	3.7	3.5	5.7	2.5
India	7.0	6.8	2.9	5.5
Indonesia	230.0	207.4	10.9	200.8
Japan	6.1	5.8	5.2	5.5
New Guinea	11.3	9.3	21.5	4.8
Pakistan	5.3	5.3		4.1
Total	362.4	338.3	7.1	322.1
Total non-Communist foreign	6,661.9	5,766.2	15.5	5,243.3
United States	6,793.1	6,451.9	5.3	6,497.9
Total free world	13,455.0	12,218.1	10.1	11,741.2
Estimated Russia and other Communist:				
Russian Occupation Zone of Austria	57.5	62.0	—7.3	60.0
Romania	125.0	110.0	13.6	90.0
Russia	1,223.0	1,123.0	8.9	1,023.0
Other Communist	36.8	34.0	8.2	27.2
Total	1,442.3	1,329.0	8.5	1,200.2
World total	14,897.3	13,547.1	10.0	12,941.4

First half 1955 production partially estimated on the basis of actual reports for most countries through April or May. Other Communist includes China, Czechoslovakia, Poland, Hungary, Albania, and Yugoslavia.



Is the end of an era near?

Price Is the Key to Growth of Gas

by Henry D. Ralph

THAT graph at the top of this page is going to show a sharp decline in the next few years—according to practically everybody who testified on the subject of natural gas before congressional committees this spring.

The graph shows the volume of natural gas moved in interstate commerce through transmission lines subject to regulation by the Federal Power Commission. The line has been going up and up for many years, and very fast since the end of the war.

Has interstate movement reached its peak? Yes, say two groups of people connected with the gas industry—but for entirely opposite reasons. Both sets of reasons are tied to federal regulation of the price of gas in the field.

Gas producers say: If the Government holds down field prices there will be no incentive to hunt for and develop new gas supplies, nor to sell more gas into interstate commerce. Instead, more and more natural gas will find markets in the states where it is produced, markets free from federal price control. (Local markets already use as much gas as the interstate lines carry.)

Gas distributors say: Unless the Government holds down field prices there will be little demand for gas in markets some distance from producing areas. The delivered price of gas in many places is now so high that consumers are losing interest in it. One more boost and natural gas will lose big hunks of its markets to coal and oil.

If either of these groups is right, the future looks dark for the growth of big gas pipelines. It seems to be a case of "damned if you do and damned if you don't."

This is the dilemma presented to Congress in the form of the Harris-Fulbright bills. After extensive hearings, committees of both the House and the Senate sided slightly with the producers. The Harris and Fulbright bills which they reported out provide for a limited and indirect federal control of field prices—somewhat more than producers say they can tolerate and considerably less than distributors say is essential.

This political compromise was designed to prevent the occurrence of either of the dire predictions forecast by the embattled opposing groups. It embodied the hope that indirect control will put a brake on rising price of gas, slowing it down so that both producers and consumers can adjust to it and holding it within a range that will discourage neither sellers nor buyers.

Escalation Is the Villain

The controversy arose from the Supreme Court decision in the Phillips case, giving FPC control over producers' sales to interstate lines. It is fanned by the fact that field prices have been rising rapidly in recent years, due to the big demand. And because gas is usually sold on 20-year contracts, it became customary to include various types of escalation clauses under which the original price would be increased under certain conditions later on.

It's these escalation clauses that are causing the trouble. They are the basis for the distributors' fears that natural gas will soon price itself out of a market.

Before the war and until about 1947 when the pipeline expansion boom began to hit, the field price of gas in the United States averaged around 5 cents per thousand cubic feet. Today the average is around 10 or 11 cents per M.c.f.

But the real story is in the Southwest, which produces about 80 per cent of the nation's gas and which supplies virtually all the gas for the postwar expan-

sion. Here the field price went from about 2 cents before the war to 5 cents in 1950 and round 9 or 10 cents, on the average, today. Many recent contracts are 50 to 100 per cent above this average, and the operation of the escalation clauses could raise the prices of older contracts quite considerably.

Now gas at 10 or 20 cents per M.c.f. is a bargain for anybody. On the basis of heat content it is far cheaper than any other fuel on the market. But most of the people who want gas are a long way from the producing fields. When a pipeline pays a dime or so in the Southwest it has to charge from two to five times as much to local distributors at distant cities. When the distributor adds his costs, the price to the homeowner may be 10 times the field price.

Here are some typical examples of how this works:

Consumer region—	Field price	City gate price	Residential price
New England	$0.08	$0.52	$2.61
Middle Atlantic	0.13	0.34	1.28
South Atlantic	0.13	0.28	0.84
North Central	0.09	0.27	0.82
Pacific	0.14	0.26	0.73
Mountain	0.07	0.20	0.62
Average	0.11	0.28	0.91

In figures like these lies the crux of the argument over the future of long-distance gas transmission. Because when gas gets up to a couple of dollars a thousand, consumers do begin to compare the cost with other fuels.

Apparently, to judge from the testimony before the congressional committees, in only a few places has gas priced itself out of any markets, and those few customers it has lost are big industrial users who measure their fuel costs in fractions of a cent and whose boilers are equipped to switch to coal or oil or back again with every price change.

So the southwestern producers say: What difference does a penny or a nickel make? The field price is only 10 per cent of the delivered price. It doesn't cost any more to handle 20-cent gas than 2-cent gas. If the field price goes up 1 cent, the consumer's price should go up only 1 cent. If the producers gave their gas away for free the consumers' bills would be cut very little, and if the field price should go up a nickel it would cost the average home user only about two bits a month.

But that extra nickel to producers means the difference between plenty of gas for everybody and very little gas for interstate pipelines. Because, they say, the price of gas in many fields is so low that it hardly pays the producers to drill for it and deliver it to the pipelines, but assurance of a better price will bring forth ample supplies for distant users.

That's what the producers told Congress in arguing for legislation to remove the price controls that the Phillips decision imposed on them.

But distributors say it's not that simple. They filled hundreds of pages of committee hearings with testimony to prove that just a small additional increase in field prices will be multiplied many times at the delivery end of the pipelines, with the immediate result of lopping off big groups of customers.

The gimmick, they said, is what's known as load factor. Here's how they explain it: Most users burn many times as much gas in the winter as they do in the summer. It would be very costly to operate either a long-distance transmission line or a local distribution system at a small fraction of its capacity during half the year. So summer-time sales are made to big industrial users on condition that they switch over to another fuel the minute the weather gets cold and residential customers want the gas. These industrial sales bring much less per M.c.f. than sales of small volumes through house meters, but they permit the pipeline and distribution system to operate at a high load factor. Without these industrial sales the price of gas to homeowners and stores would be far higher than it is.

Now, the distributors say, every time the field price goes up 1 cent, the price to industrial consumers goes up 1 cent. And that 1 cent will be enough to make some large users stick to coal or oil all year around instead of switching to gas in the summer. That will lower the companies' load factors and increase their operating costs, so they will have to raise the price of gas to their remaining customers by more than 1 cent.

This increase of more than 1 cent will cause another block of customers to shy away from gas. Then the price to the remaining customers will have to be raised still more. And so it goes, with every small increase in field prices spiraling and pyramiding to small consumers hundreds of miles away. And pretty soon the cost of gas for home heating and maybe even for cooking will be so high that users will junk their gas burners and turn to some other fuel.

That's what the distributors told Congress in arguing against legislation to remove field prices from the full FPC control imposed by the Phillips decision.

The distributors did not present any very convincing statistics on a regional basis to show just how high gas prices can go before various groups of customers will start switching to other fuels. Apparently the point of price competition varies from city to city and even among customers. But a number of distributor witnesses did present voluminous testimony to show that in certain cities they serve in the Atlantic seaboard and Great Lakes regions the increases in the delivered price of gas during the past year or so—all of which they attributed to escalation of field prices—have scared away many potential new customers and threaten to result in substantial disconnections.

Make Your Own Prediction

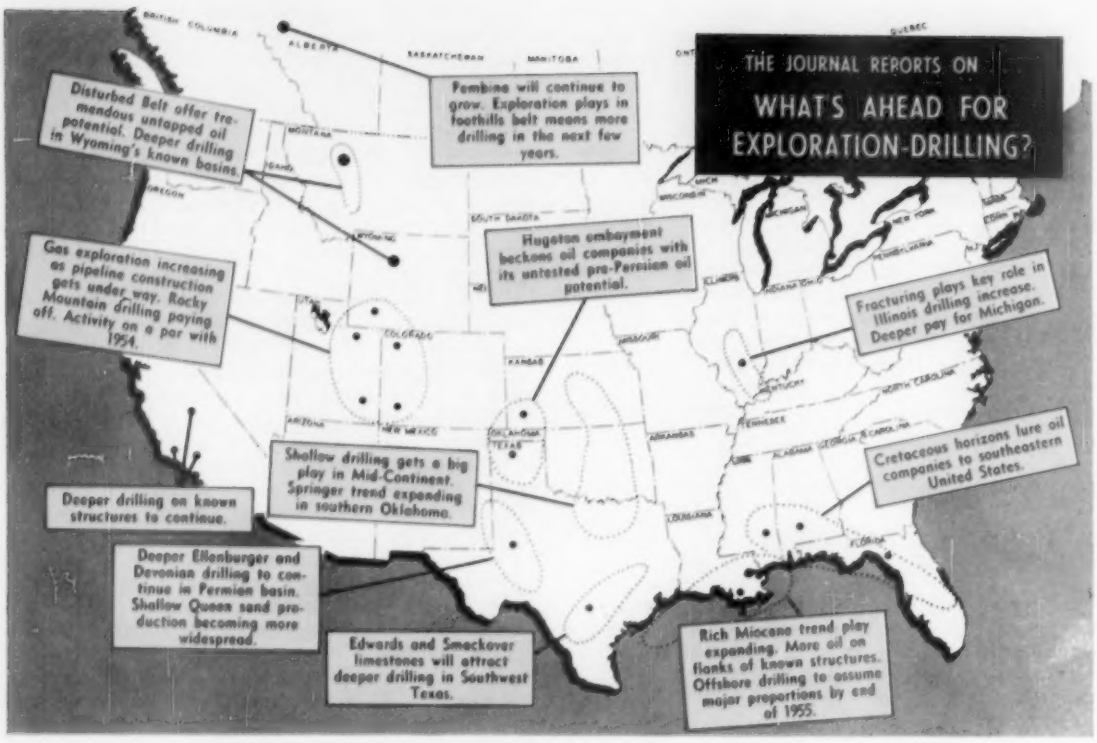
To get back to the chart at the head of this article and the question of whether the line will turn down sharply in a year or two.

Prophecy is dangerous. Obviously both producers and distributors can't be right in their prophecies. Or could they? It could be that they are both partly right.

So if you want to make your own prophecy as to the future of interstate gas transmission, and if you give more weight to economic factors than to political arguments, you might reach some conclusions along these lines:

Field prices of gas will go up some whether there is federal regulation or not (almost everybody admits that regulation wouldn't stop all increases, and that there would be some limit with no regulation). They will stabilize somewhere above the present average at a figure high enough to induce a lot of producers to sell but low enough to induce a lot of consumers to keep on buying.

From there you could go on to predict that the interstate market for natural gas may not grow nearly as fast as it has in the last few years but that it won't turn sharply down until—perhaps a good many years from now—gas really gets scarce and expensive to find, or prices of other fuels get much cheaper in the large consuming areas, or the producing states develop new uses for gas which will pay more than the interstate pipelines can afford to pay, or atomic energy displaces everything else, or something.


THE JOURNAL REPORTS ON
WHAT'S AHEAD FOR EXPLORATION-DRILLING?
Disturbed Belt offer tremendous untapped oil potential. Deeper drilling in Wyoming's known basins.
Pembina will continue to grow. Exploration plays in foothills belt means more drilling in the next few years.
Gas exploration increasing as pipeline construction gets under way. Rocky Mountain drilling paying off. Activity on a par with 1954.
Hugoton embayment beckons oil companies with its untested pre-Permian oil potential.
Fracturing plays key role in Illinois drilling increase. Deeper pay for Michigan.
Shallow drilling gets a big play in Mid-Continent. Springer trend expanding in southern Oklahoma.
Cretaceous horizons lure oil companies to southeastern United States.
Deeper drilling on known structures to continue.
Deeper Ellenburger and Devonian drilling to continue in Permian basin. Shallow Queen sand production becoming more widespread.
Edwards and Smackover limestones will attract deeper drilling in Southwest Texas.
Rich Miocene trend play expanding. More oil on flanks of known structures. Offshore drilling to assume major proportions by end of 1955.

No bets being overlooked in drilling

Old Fields Reworked; Offshore Areas Pay Off

by Norman S. Morrisey
Drilling-Development Editor

GAMBLING on offshore possibilities has netted oil companies 19 new fields during 1955 and the future prospects are excellent for more oil production.

The intensive offshore drilling campaign is still in its infancy. Now there are about 50 rigs active and by January 1, 1956, there should be at least 100 turning to the right.

Prolific Miocene sands both offshore and in South Louisiana make these areas the nation's No. 1 exploration province. And the present exploration program promises a bright drilling future for the next several years. Offshore leasing continues to break records for bonuses paid and clearly indicates that there are still undrilled structures beneath the waters of the gulf.

Shallow sands nationwide are receiving a big play, especially in old producing areas. The outlook is for more shallow drilling, especially by the small independent.

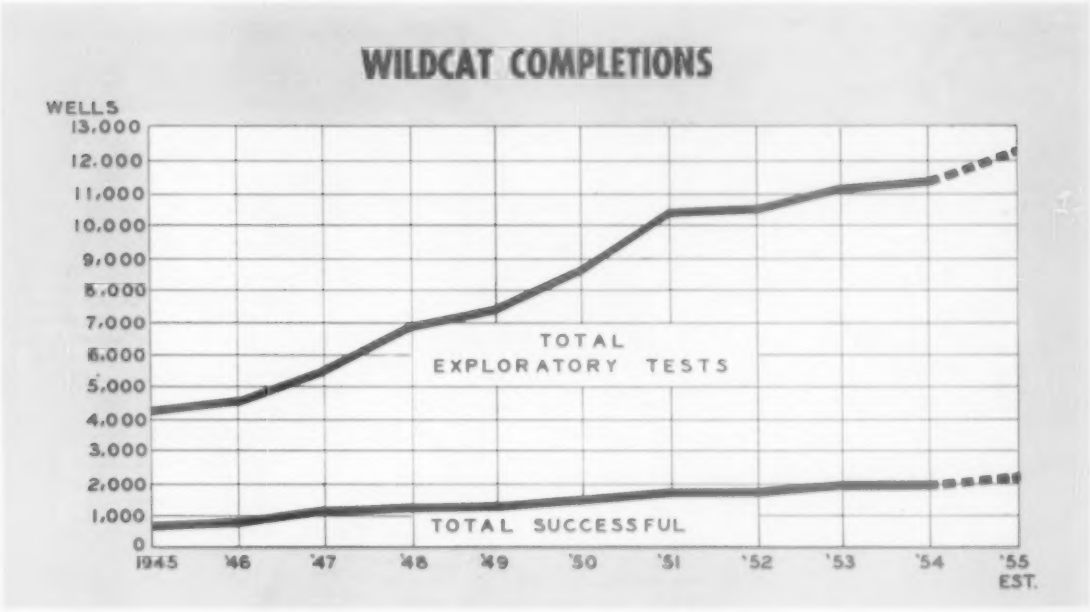
Canada . . . Next to Louisiana's Miocene trend, Canada holds the spotlight; and in the years to come our northern neighbor may surpass the best the United States has to offer. In the last 10 years, Canada's production has skyrocketed from 19,000 bbl. per day in 1946 to 350,000 bbl. per day in 1955. And the output continues to climb.

Canadian exploration and drilling, like South Louisiana and offshore work, is expensive, but more major fields like Pincher Creek, Turner Valley, and Leduc will be found. Today in Canada exploration is focused on the foothills belt rather than the plains of Alberta and Saskatchewan. Oil companies are trying to evaluate rapidly large government leases with the seismograph and the bit. This can only mean more production from a country rich in mineral and oil resources.

Canada is handicapped by its lack of pipeline outlets and markets, but its strategic importance insures it a prosperous oil future.

West Texas . . . Deep drilling continues to dominate the West Texas picture and this trend will continue for the next year or two. Many of the shallow Permian fields conceal deeper Ellenburger structures; at least 12 have been tapped in the first 6 months of 1955 and found productive. But companies are stepping out and finding Devonian and Ellenburger production in wildcat country.

North Texas . . . Grayson County is in the midst of an intense drilling program that will carry through the rest of 1955. Development in this country has been steadily expanding during the past 5 years, and probably is just reaching its peak.



Southwest Texas . . . Although deeper pays like the Smackover and Edwards limestones offer excellent possibilities for future production, drilling is largely confined to the known trends like the Frio and the Yegua-Cockfield. Oil companies are combing over Southwest Texas and uncovering small fields that were originally passed over because of their small size or poor sands.

Ark-La-Tex . . . Operations in the Ark-La-Tex fields will stay at about the present level for the remainder of 1955. Drilling for gas in East Texas accounts for much of the activity, but geologists are looking for deeper pay zones like the Smackover to bolster the oil reserves.

Hugoton embayment . . . Pre-Permian pay zones have converted the Panhandles of Oklahoma and Texas from a senile area into a young bustling oil province. This change has been effected in the past few years and the upsurge of activity will probably increase rather than decline during the next 18 months.

Mid-Continent . . . Shallow drilling in the older areas will keep Oklahoma and Kansas at a fairly high level for the remainder of 1955. Deeper drilling in southern Oklahoma has been somewhat curtailed because of the reduced allowables and long payouts on expensive wells. Much of the Mid-Continent drilling is aimed at developing shallow sands that can be fractured successfully.

Rocky Mountains . . . Although the boom days of the Williston basin and Weston County, Wyoming, are over, drilling and exploration in the Rocky Mountains for 1955 will rival or even surpass 1954. The emphasis is shifting to structural plays along the mountain fronts rather than strat traps. Oil companies are looking to the Disturbed Belt of Montana and drilling is up in the basins of Central Wyoming. Drilling has been curtailed nearly 50 per cent in Wyoming, largely due to reduced drilling along the Newcastle trend in Weston and Niobrara counties. Elsewhere, however, the outlook is good for a banner year.

Best prospects for future drilling in the Rockies appear to lie in the basins of western Colorado and Wyoming and eastern Utah and in the Disturbed Belt of Montana.

California . . . Oil companies are looking for deep reserves on known structures as one of the main sources of new oil. The results of the past few years have been gratifying and show that the old structures will play a key role in California drilling for the next several years. Offshore drilling may increase as a result of recent legislation.

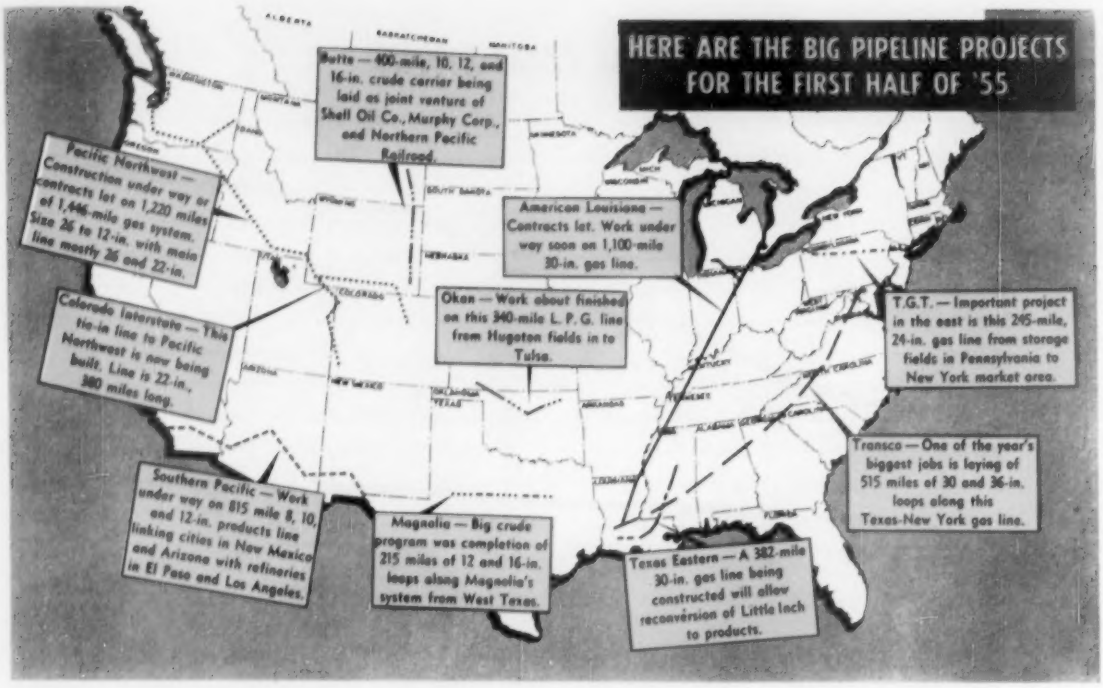
Pacific Northwest . . . Increased exploratory work in Washington and Oregon is paving the way for new drilling in the Pacific Northwest. Several small basins could easily become producers over night to turn the heat on this quiet area.

Southeastern United States . . . Here potentially is a vast petroliferous province that should eventually blossom into an important oil province. Drilling in southeastern United States will continue at about the same level for the rest of the year.

Eastern United States . . . Illinois drilling is up more than one-third over the 1955 figure and should maintain this pace for the rest of 1955. Fracturing, shallow drilling, and lack of proration make the state especially attractive to the independents.

Appalachian activities are slightly lower than in 1954 and probably will not change during the rest of the year. Deeper pays are still the main hope for the area, but as yet they have not proved productive.

Drilling trends . . . Two trends have been established during the past several years in exploratory and development: deeper drilling on known structures and drilling on known structures for shallow zones that were originally overlooked or considered uneconomic. This type of drilling will uncover more rich reserves and, in addition, is a fairly economic method of exploration. Probably the best examples of deeper drilling on known structures can be found in California and West Texas. But this method is not confined to one part of the country.


HERE ARE THE BIG PIPELINE PROJECTS FOR THE FIRST HALF OF '55
Butte — 400-mile, 10, 12, and 16-in. crude carrier being laid as joint venture of Shell Oil Co., Murphy Corp., and Northern Pacific Railroad.
Pacific Northwest — Construction under way or contracts let on 1,220 miles of 1,446-mile gas system. Size 26 to 12-in. with main line mostly 26 and 22-in.
American Louisiana — Contracts let. Work under way soon on 1,100-mile 30-in. gas line.
Colorado Interstate — This tie-in line to Pacific Northwest is now being built. Line is 22-in., 380 miles long.
Okan — Work about finished on this 340-mile L. P. G. line from Hugoton fields in to Tulsa.
T.G.T. — Important project in the east is this 245-mile, 24-in. gas line from storage fields in Pennsylvania to New York market area.
Transco — One of the year's biggest jobs is laying of 515 miles of 30 and 36-in. loops along this Texas-New York gas line.
Southern Pacific — Work under way on 815 mile 8, 10, and 12-in. products line linking cities in New Mexico and Arizona with refineries in El Paso and Los Angeles.
Magnolia — Big crude program was completion of 215 miles of 12 and 16-in. loops along Magnolia's system from West Texas.
Texas Eastern — A 382-mile 30-in. gas line being constructed will allow reconversion of Little Inch to products.

Pipeliners building 7,300 miles of arteries

Gas Lines Set Hot Pace; Crude, Products Lag

by Robert G. Deering
Assistant Pipeline Editor

LONG gas lines are the big news in pipelining at this year's halfway mark. Work on them is running well ahead of the past several years' averages. The total of 5,000 miles on which work is now in progress is about 2,000 miles ahead of the usual figure at this time of year.

The reverse is true in the case of crude and products lines. In both these categories, construction, contracts, and announcements are behind the average for a mid-year report.

In July of last year, products lines completed, under way, or contracted totaled about 3,000 miles. Crude lines added another 1,700 miles. This year the total for crude and products amounts to about 2,300 miles.

Thus, on a total mileage basis, construction at mid-year is about even with that of previous years. Where crude and products construction falls short, gas lines take up the slack. Dollarwise, however, this year's construction is well out in front. While some big crude lines were being built last year at this time, most work was on smaller products lines. This year the lion's share goes to the big gas lines—far more expensive to lay.

What's ahead . . . As far as gas-pipeline laying goes, the outlook is for one of the best years in pipeline history. Some 4,500 additional miles of gas trunklines have been approved or are now before the Federal Power Commission with good chance of approval. A big percentage of this mileage will be started this year.

Laying of both crude and products pipelines usually starts late. Thus, with the already heavy emphasis on early gas-line construction, it is natural that other work would lag. There is only so much equipment for main-line work and that is being used. Therefore, expect construction of both crude and products lines to pick up toward summer's end and probably equal the average of the past several years.

Gas Lines

Under way . . . A half-dozen big projects make news in gas pipelining for this midyear report. Pacific Northwest Pipe Line Co. has let contracts and started work on over 1,200 miles of its 26 and 22-in. mainline from the San Juan basin into Oregon and Washington. Colorado Interstate is now building a 380-mile 22-in. to tie in with Pacific in southwestern Wyoming.

Texas Eastern Transmission Corp. is well under way on the 382-mile 30-in. line to allow conversion of the Little Inch to products. The 30-in. runs from south Louisiana to Kosciusko, Miss., where it ties to Texas Eastern's existing 30-in. to the East Coast.

Tennessee Gas Transmission Co. is laying a 245-mile 24-in. line in Pennsylvania, completing a 1,000-mile loop in that area. It will allow T.G.T. to deliver gas through either of two lines into the New York area from storage fields in western Pennsylvania.

Transcontinental Gas Pipe Line Corp. is now laying over 500 miles of 30 and 36-in. loops along its main

line. Work is going on in Louisiana, Mississippi, Alabama, Georgia, the Carolinas, Virginia, and Maryland. Over 300 miles of 36-in. is included in the program, by far the largest use of 36-in. to date. Transco pioneered with this large-diameter pipe last year with a 50-mile looping project.

Newest big gas line in the country will kick off early in August. This is American Louisana Pipe Line Co.'s 1,100-mile 30-in. from Louisiana to Detroit. About 700 miles will be laid this year.

Texas Gas Transmission Corp. is also engaged in a big looping program this year. About 320 miles of 12, 20, 26, and 30-in. pipe will be laid. Most of it is 26 and 30-in.

Though it isn't under way yet, work on Westcoast Transmission Co., Ltd.'s main line will probably start by late summer. This is a 650-mile line to bring gas from Peace River, northwestern Alberta, to the United States border above Bellingham, Wash. Size of the line has just been upped from 24 to 30-in.

Biggest gas line under way now in Canada is that of Saskatchewan Power Corp. This is a 226-mile 10, 12, and 14-in. line from Prince Albert to Saskatoon to Coleville, Alberta.

Proposed . . . Some very large gas projects are still on the books but won't get started this year. The largest is Trans-Canada Pipe Line, Ltd., which ran into financing difficulties which prevented its starting this summer.

Present plans for Trans-Canada appear quite fluid. Latest proposal is for Trans-Canada to build a line to the Manitoba-Minnesota border and deliver gas to Tennessee Gas Transmission Co. The latter has proposed a line running from Minnesota south of the Great Lakes into Northwest Pennsylvania. Some gas would be delivered back into Canada to serve Toronto, Hamilton, and Montreal and the rest to go to eastern United States markets.

Later, as markets develop in eastern Canada, the all-Canadian line could be completed as per Trans-Canada's original plans. The above plan appears to have support in Canadian Government circles and may be the only feasible way to get the big Trans-Canada system off dead center. Even with its past troubles, hopes are high to get Trans-Canada started next year.

Northern Natural Gas Co. still has definite plans for making use of Canadian gas, too. That company's original proposal for tying on to Trans-Canada near the border at Emerson, Man., is still before the FPC. Northern Natural has plans for laying about 550 miles of line if and when Canadian gas is brought to Emerson.

In connection with the Pacific Northwest project, El Paso Natural Gas Co. has three alternate plans for supplying more gas to northern California. One plan involves looping of the San Juan basin-Needles, Calif., line—about 500 miles of 34-in. The two others are to lay 30-in. lines to the California border from tie-ins with Pacific Northwest either at Mountain Home, Idaho, or at Pendleton, Ore.

Products Lines

Under way . . . Two big important projects mark the products pipeline picture. One is the line of Southern Pacific Pipe Line, Inc., and the other is the conversion of the famed Little Inch back to products.

Southern Pacific Pipe Line, subsidiary of Southern Pacific Lines (railroad), is now building an 800-mile line across California, Arizona, and New Mexico. This is the first products line in that area and the first big pipeline ever built by railway interests. Line size varies from 8 to 12 in.

Conversion of Texas Eastern's Little Inch back to products is the biggest news in products pipelining that has hit the industry in years. Recent hearings by FPC have given the project a green light and preparatory work to convert the stations should start soon.

The 30-in. replacement line for the Little Inch will be finished by fall, allowing retirement of the 20-in. from gas service by winter. Products, including L.P.G., are expected to be flowing in the line by mid-1956.

When conversion is complete the Little Inch will be able to deliver 265,000 bbl. per day into the East. The line will handle L.P.G. as well as conventional fuels.

Other projects under way or announced include: a 106-mile 12-in. line by Great Lakes Pipe Line Co. from Des Moines to Iowa City, Iowa; a 50-mile 6-in. from Enid to Ponca City, Okla., by Champlin Refining Co.; and a 140-mile 6-in. L.P.G. line from the Hugoton fields into Tulsa by Okan Pipe Line Co.

Proposed . . . Sioux Oil Co. has announced plans to build a 55-mile 6-in. products line from Newcastle, Wyo., to Rapid City, S. D.

American Pipe Line Co.'s plans for a big-inch from Texas to New York are still in existence but must be heavily discounted since the Little Inch conversion went through.

Moore Stoner Co. still has plans for a 200-mile 6-in. from Glendive, Mont., to Minot, N. D.

Crude Lines

Under way . . . Biggest crude-pipeline project under way at this time is that of Butte Pipe Line Co. This 400-mile, 10, 12, and 16-in. line will move Williston basin crude south into Wyoming for connections with lines going into Wood River or Chicago. Partners in the joint venture are Shell Oil Co., Murphy Corp., and Northern Pacific Railroad.

Already completed is an important project for Magnolia Pipe Line Co. This was a 215-mile 12 and 16-in. looping program along the company's West Texas Corsicana trunk system. Laying of the line allowed conversion of smaller trunk lines to L.P.G. service.

Other crude lines now under way include: a 78-mile 8-in. from the Sumatra pool to Billings and Laurel in Montana, being laid by Art Hartwig, Inc.; a 106-mile 12 and 16-in. line from Sturgeon Lake field to Edson, Alta., by Peace River Oil Pipe Line Co., Ltd.; and a 24-mile 8-in. line from Hominy to Sand Springs, Okla., by Mid-Continent Pipe Line Co.

Proposed . . . Stanmount Pipeline Co. proposes a 110-mile line from Tioga, N. D., to a connection with Interprovincial Pipe Line Co. at Cromer, Man.

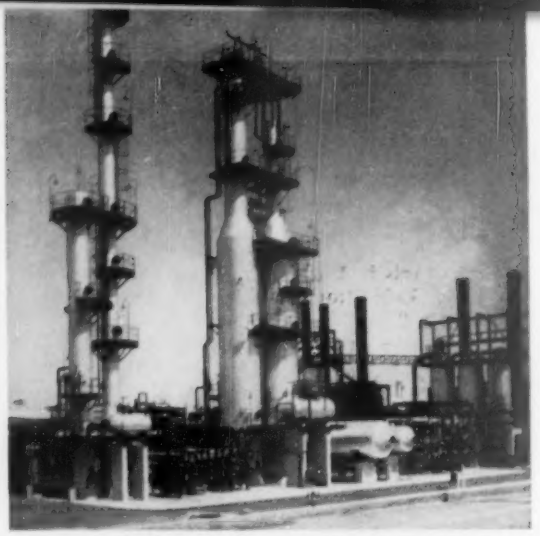
Still in the proposal stage is the big-inch crude line from West Texas to California planned by West Coast Pipeline Co. Congressional hearings are being held on the proposal but little chance is seen for its winning government backing at this time.

Standard Oil Co. of California has just made a proposal which will affect West Coast's plans. Standard will replace its 195-mile dual 8-in. lines from Wink to El Paso with one 20-in. Then, in an emergency, Southern Pacific's products line could be converted and deliver West Texas crude into Los Angeles refineries. Standard will start soon on 70 miles of the 20-in.

Another big crude line for the West has been hinted by Union Oil Co. This would be a 12 or 16-in. line from Rifle, Colo., to Los Angeles, about 815 miles, to carry semirefined output of Union's shale-oil plants in Colorado.

For a complete listing of current pipeline projects —proposed, planned, contracted, and under way—refer to the Pipeline Patrol section of this issue.

1. GRADING AND SITE PREPARATION work have just gotten under way for Tide Water Associated Oil Co.'s 130,000-bbl. refinery at Delaware City, Del. The refinery is expected to be ready for operation about January 1957.



2. THIS UNIFINING-PLATFORMING unit is typical of the new hydrogenation-catalytic reforming units being built all over the country. This 22,000-bbl. unit is located at the Richmond refinery of Standard Oil Co. of California.

3. NEW REFINERY is just nearing completion at St. Paul. This 25,000-bbl. plant of Great Northern Oil Co. will be finished in August, and crude processing will begin soon thereafter.

Refineries Are Bustin' Out All Over

by John M. McGivern

MUCH as June in the musicomedy, Carousel, refineries are bustin' out all over in various parts of the United States these days. And the prospect is that more might begin bustin' out before the end of the year.

General Petroleum Corp.'s plant at Ferndale, Wash., was the first bloomer of 1955 when it came on stream with its 37,000-bbl. plant early in the year.

Right now it appears that the second major refinery to begin operations this year in the United States will be Great Northern Oil Co.'s Pine Bend, Minn., plant. As the recent picture above shows, most units are standing, and only a major mishap will throw the first stream day for the 25,000-bbl. facility far off the August 1 deadline.

Shell Oil Co. will place its 50,000-bbl. refinery at Anacortes, Wash., on the line about October 1, although some units will be ready for use before then.

Two other plants, not quite as tall as the elephant's eye yet, are just getting under way in Delaware and Virginia.

Tide Water Associated Oil Co. is replacing its abandoned Bayonne, N. J., plant with an ultramodern 130,000-bbl. refinery at Delaware City, Del. As the picture shows, Tide Water is in the very first stages of land clearing and grading.

American Oil Co. is a little further along with its 35,000-bbl. refinery at Yorktown, Va., and will be on stream for sure in 1956. Tide Water possibly will lap over into 1957 before being fully ready.

The island territory of Puerto Rico to the south recently saw its first major refining installation begin operations. Caribbean Refining Co. began processing in May with its 10,500-bbl. refinery at Bayamon. The island's second plant will go on stream later this year when Commonwealth Oil Refining Co., Inc., starts its 23,500-bbl. refinery at Guayanilla Bay.

Elsewhere in the United States there are rumors of refineries in Mississippi, Florida, and Washington. And while all of them might be built in due time, no construction has begun yet.

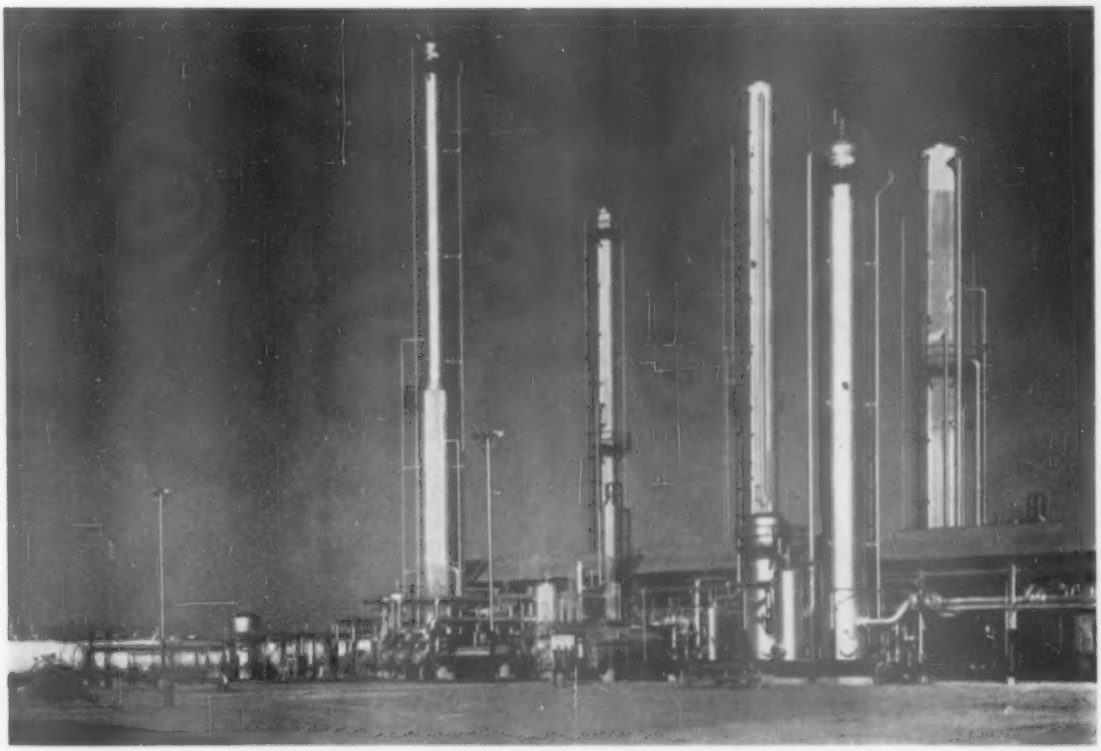
Journal Refinery-Construction Survey

Active expansion projects, capacities, and target dates

Company, location of refinery, and type of project—	Capacity or prod. rating (bbl. per stream day)	Completion schedule
A		
American Oil Co., Yorktown, Va.:		
New refinery	35,000	1956
Model B Orthoflow cat cracker	30,000	1956
Cat poly unit	6,000	1956
Delayed-coking unit		1956
Anderson-Prichard Oil Corp., Cyril, Okla.:		
Expanding poly unit	80	1955
Anderson-Prichard Oil Corp., Arkansas City, Kans.:		
Building Platformer	5,000	Nov. 1955
Ashland Oil & Refining Co., Buffalo:		
Planning reforming unit. Type not determined	4,000	4- 1-56
Planning catalytic hydrogenation unit. Type not determined	5,000	4- 1-56
Ashland Oil & Refining Co., Catlettsburg, Ky.:		
Adding to crude unit	16,000	4- 1-56
Planning cat cracker. Type undetermined	32,000	4- 1-56
Ashland Oil & Refining Co., Findlay, Ohio:		
Planning reforming unit. Type undetermined	3,000	4- 1-56
Planning catalytic hydrogenation unit. Type undetermined	4,000	4- 1-56
Aurora Gasoline Co., Detroit:		
Building fluid coking unit	4,000	Late 1955
Adding to present fluid cat cracker	1,500	Fall 1955
Building Unifiner	7,500	Late 1955
Production from coker (tons)	100	Late 1955
B		
Bankline Oil Co., Bakersfield, Calif.:		
Planning $4 million expansion program to include cat reformer, coker, and conversion of hydrofluoric acid alkylation unit into a sulfuric acid alkylation unit		1956
Berry Asphalt Co., Waterloo, Ark.:		
Increasing asphalt capacity	600	1955
Big West Oil Co., Kevin, Mont.:		
Building Platformer	1,000	10- 1-55
C		
California Oil Co., Perth Amboy, N. J.:		
Planning a crude-oil desalter unit		
Carter Oil Co., Billings, Mont.:		
Building Hydrofiner	6,900	Late 1955
Catalytic reformer	2,500	Late 1955
Century Refining Co., Inc., Shallow Water, Kans.:		
Planning Platforming unit	1,000	1955
Adding oxidized asphalt capacity	600	1955
Champlin Refining Co., Enid, Okla.:		
Adding to crude capacity	8,000	1956
Increasing vacuum unit	4,000	1956
Building Orthoflow catalytic cracker	9,000	Late 1955
Adding catalytic polymerization	1,200	Late 1955
Col-Tex Refining Co., Colorado City, Tex.:		
Adding to polymerization unit	80	1955
Commerce Oil Refining Corp., Portsmouth, R. I.:		
Planning new refinery	30-40,000	
Catalytic cracking	25,000	
Catalytic reforming		
Catalytic poly		
Hydrogenation		
Coking unit		
Commonwealth Oil Refining Co., Inc., Guayanilla Bay, Puerto Rico:		
Building new refinery	23,500	Late 1955
Vacuum unit	17,000	Late 1955
Houdriflow cat cracker	26,800	Late 1955
Houdriforming unit	3,700	Late 1955
Alkylation unit, sulfuric acid type	1,400	Late 1955
Catalytic poly unit	900	Late 1955
Consumers Cooperative Refinery Association, Scottsbluff, Neb.:		
Building catalytic reforming unit		11- 1-55
Continental Oil Co., Ponca City, Okla.:		
Adding wax plant		Late 1955
Cosden Petroleum Corp., Big Spring, Tex.:		
Adding to fluid cat cracker	3,000	Fall 1955
Planning second reformer unit. Type undecided	3,200	9- 1-55
Crystal City Refining Co. of Carson City, Inc., Carson City, Mich.:		
New owners planning a remodernization program		
D		
Derby Oil Co., Wichita:		
Building Ultraformer		Jan. 1956
D-X Sunray Oil Co., Tulsa:		
Building delayed-coking unit	7,000	11- 1-55
Adding to fluid cat cracker	3,500	9- 1-55
Production from coker (tons)	240	11- 1-55
E		
Esso Standard Oil Co., Everett, Mass.:		
Planning Hydrofiner for cracked naphtha feed stock	2,400	
Planning Hydrofiner for cracked heating oil	2,250	
Esso Standard Oil Co., Baton Rouge, La.:		
Planning Hydrofiner for virgin gas oil	26,200	
Planning Hydrofiner for coker gas oil and naphtha	12,740	
F		
Frontier Refining Co., Cheyenne, Wyo.:		
Adding to present crude unit	2,500	8- 1-55
Building Platformer	2,500	8- 1-55
Installing Unifiner	3,000	8- 1-55
G		
General Petroleum Corp., Ferndale, Wash.:		
Building a naphtha pretreater unit		Sept. 1955
Golden Bear Oil Co., Bakersfield, Calif.:		
Building vacuum unit	3,500	Fall 1955
Great Northern Oil Co., Pine Bend, Minn.:		
Building new refinery	25,000	8- 1-55
Delayed coker (tons)	450	8- 1-55
Thermofor cat cracker	12,000	8- 1-55
Ultraformer	5,000	8- 1-55
Hydrodesulfurization	11,000	8- 1-55
Catalytic poly.	900	8- 1-55
Great Plains Refinery & Development Co., Rapid City, S. D.:		
Building new refinery	5,000	Early '56
Thermofor cat cracker	3,000	Early '56
Cat poly unit		Early '56
Gulf Oil Corp., Port Arthur, Tex.:		
Adding to crude unit	74,400	1956
Increasing vacuum unit	30,000	1956
Adding to fluid cat cracking capacity	54,000	1956
Building two Gulfining units, each	20,000	Spring '56
H		
Humble Oil & Refining Co., Baytown, Tex.		
Expanding existing Hydrofiner	16,000	
Building Hydrofiner to desulfurize lube oils	8,770	
Hunt Oil Co., Tuscaloosa, Ala.:		
Increasing crude-oil unit	800	9- 1-55

Journal Refinery-Construction Survey (Continued)

Company, location of refinery, and type of project—	Capacity or prod. rating (bbl. per stream day)	Completion schedule
L		
Lakeside Refining Co., Kalamazoo, Mich.:		
Building visbreaking unit	1,500	1955
Leonard Refineries, Inc., Alma, Mich.:		
Increasing crude capacity	3,500	1955
Ultraformer	3,600	1955
Building a Hydroformer	4,200	1955
M		
Magnolia Petroleum Co., Beaumont, Tex.:		
Planning to increase crude unit	15,000	1958
Increasing vacuum unit	35,200	1957
Planning to increase Thermofor cat capacity	35,800	1957
Thermofor reformer	19,500	1955
Sovaformer	11,000	1958
Sovaformer	6,700	1959
Sovafining	30,000	1956
McMurrey Refining Co., Tyler, Tex.:		
Building sulfuric alkylation unit	1,300	Fall 1955
Miami Oil & Refining Co., Fort Pierce, Fla.:		
Planning new refinery	15,000	8- 1-56
N		
New Mexico Asphalt & Refining Co., Artesia, N. M.:		
Adding to crude unit	2,500	1955
North American Petroleum Corp., Corpus Christi, Tex.:		
Company building 2,000-bbl. cat reformer		Late 1955
Northwestern Refining Co., St. Paul Park, Minn.:		
Adding to crude unit	5,000	9- 1-55
Building thermal poly unit	500	4- 1-55
O		
Oriental Refining Co., Denver:		
Rebuilding thermal cracking unit destroyed by fire	3,500	Fall 1955
P		
Pacific Oil & Refining Co., Tacoma, Wash.:		
Company will build refinery under a new company name	10,000	
Pennzoil Co., Rouseville, Pa.:		
Planning combination Unifiner-Platformer unit	6,100	1956
Phillips Petroleum Co., Phillips, Tex.:		
Adding Platformer	16,000	1955
Phillips Petroleum Co., Kansas City:		
Building catalytic reforming unit	16,000	Spring '56
Pontiac Eastern Corp., South Central Mississippi:		
Planning new refinery	12,000	
Pure Oil Co., Lemont, Ill.:		
Company has plans to build cat reformer. Size and type undetermined		1956
Pure Oil Co., Nederlands, Tex.:		
Building catalytic reformer	15,000	Spring '56
Adding feed preparation unit	20,000	Spring '56
R		
R&J Oil & Refining Co., Princeton, Ind.:		
Planning thermal poly unit		1955
Richfield Oil Corp., Watson, Calif.:		
Building Sinclair-Baker reforming unit	17,000	Summer '56
S		
Shell Oil Co., Anacortes, Wash.:		
Building new refinery	50,000	8- 1-55
Vacuum unit	19,000	10- 1-55
Fluid cat cracker	22,000	10- 1-55
Platformer	8,000	8- 1-55
Hydrodesulfurization	8,000	8- 1-55
Catalytic poly	3,800	10- 1-55
Sinclair Refining Co., Marcus Hook, Pa.:		
Building 2 crude units to replace old ones, each	60,000	Summer '56
Sinclair Refining Co., Houston:		
Adding a Sinclair-Baker reforming unit	24,000	1956
Sioux Oil Co., Newcastle, Wyo.:		
Adding to crude unit	2,000	Late 1955
Adding gas-oil cracking unit	1,000	Late 1955
Adding to cat poly unit	75	Late 1955
Socony Mobil Oil Co., Inc., Buffalo:		
Gasoline treating unit		9- 1-55
Socony Mobil Oil Co., Inc., Paulsboro, N. J.:		
Sovaformer	20,000	11- 1-55
Socony Mobil Oil Co., Inc., Trenton, Mich.:		
Sovaformer	9,000	12- 1-55
Socony Mobil Oil Co., Inc., East Chicago, Ind.:		
Sovaformer	9,000	12- 1-55
Catalytic poly unit		12- 1-55
Company also has future plans for Sovaformers at East St. Louis, Casper, Buffalo, and Brooklyn.		
Standard Oil Co. of Calif., Honolulu, Hawaii:		
Planning new refinery	20-30,000	
Standard Oil Co. (Ind.), Whiting, Ind.:		
New crude unit. Company will retire some old units	60,000	Early '56
New vacuum unit. Company will retire some old units	22,800	Early '56
Standard Oil Co. (Ind.), Wood River, Ill.:		
Planning continuous coker	9,500	1957
Production from coker (tons)	330	1957
Standard Oil Co. (Ind.), Sugar Creek, Mo.:		
Building Ultraformer	14,000	Late 1955
Standard Oil Co. (Ind.), Mandan, N. D.:		
Planning Ultraformer	3,750	1956
Standard Oil Co. of Ohio, Cleveland:		
Building Ultraformer	11,000	1956
Standard Oil Co. of Ohio, Lima, Ohio:		
Adding to cat poly unit	200	Summer '55
Sunset Oil Co., Portland, Ore.:		
Proposed refinery	20,000	
T		
Texas City Refining, Inc., Texas City, Tex.:		
Planning a reforming unit. Type undecided	6,000	1955
The Texas Co., Tulsa:		
Building Platformer	9,000	9- 1-55
The Texas Co., Lockport, Ill.:		
Building Platformer	11,000	9- 1-55
The Texas Co., Casper, Wyo.:		
Building Unifiner-Platformer	4,800	Spring '56
Tide Water Associated Oil Co., Delaware City, Del.:		
Building new refinery	130,000	Late 1956
Orthoflow cat cracker	102,000	Late 1956
Fluid coker	42,000	Late 1956
Houdriformer		Late 1956
Hydrodesulfurization		Late 1956
Catalytic poly unit		Late 1956
Alkylation unit		Late 1956
Sulfur recovery plant		Late 1956
Tide Water Associated Oil Co., Avon, Calif.:		
Planning fluid coking unit	42,000	
U		
Union Oil Co., Rifle, Colo.:		
Company planning a shale-oil plant	40,000	
Utah Oil Refining Co., Salt Lake City:		
Building Ultraformer	5,500	1956
V		
Vickers Petroleum Co., Inc., Potwin, Kans.:		
Considering reforming units, increasing cat poly unit, asphalt capacity, and coking unit		
W		
Wisconsin Oil Refining Co., Inc., Sheboygan, Wis.:		
Building vacuum unit	1,000	1955



FOX GASOLINE PLANT of Signal Oil & Gas Co., Carter County, Oklahoma, is typical of the new construction in this field. The plant processes some 35 million cubic feet of gas per day.

JOURNAL SURVEY

Natural-Gasoline-Plant Construction

Projects under construction, planned, or proposed will add some 400 million cubic feet per day of gas-processing capacity in the U. S.

Company and Location	Capacity	Completion Date
Atlanta Gas Co., Inc., Magnolia, Ark.:		
Proposing two plants. Location undetermined		
Atlantic Refining Co., Crane, Tex.:		
Adding to Block 31 plant in Crane County, Texas. Capacity will be increased to 43 M.M.c.f. for gas injected or 48 M.M.c.f. for gas input to plant		Oct. 1955
Cities Service Oil Co.-Forest Oil Corp., Midland, Tex.:		
Companies building a $7,000,000 natural-gasoline plant in western Midland County, Texas	50 M.M.c.f.	Late '55
Davis, Heineman & Wagner, Denver:		
Planning plant in Weston County, Wyoming	50 M.M.c.f.	Late '55
Empire Oil Co., Dallas		
Building plant near Odessa in West Texas	10 M.M.c.f.	Sept. '55
Equitable Gas Co., Pittsburgh:		
Planning plant at Maytown, Ky.	50 M.M.c.f.	Early '56
Humble Oil & Refining Co., Houston:		
Building plant near Ironton, Tex., in Neches Woodbine field	11 M.M.c.f.	Late '55
Planning absorption plant near Encino, Tex.		Late '55
Kimball Gas Products Co., Long Corners, Neb.:		
Building a $1,000,000 plant	10 M.M.c.f.	Sept. '55
Phillips Petroleum Co., Andrews, Tex.:		
Building plant in Andrews County, Texas	33	Late '55
Sinclair Oil Co., Silsbee, Tex.:		
Company is winding up work on plant in the South Hampton field near Silsbee	25	Late July 1955
Sunray Mid-Continent Oil Co., Tulsa		
Company building cycling plant in Northwest Branch field of Louisiana	24 M.M.c.f.	Late '55
Building plant in San Particio County, Texas, to cost $3,000,000	140 M.M.c.f.	Feb. '55
Tennessee Gas Transmission Co., San Salvador, Tex.:		
Building a dehydration plant	50 M.M.c.f.	Aug. '55
Texas Natural Gasoline Corp., Silver, Tex.:		
Building plant in Coke County, Texas	70 M.M.c.f.	Oct. '55
Tri-Co Gas Co., Newcastle, Wyo.:		
Company moving gasoline plant from Oklahoma to set up in Clareton field, Wyoming	5 M.M.c.f.	Fall '55
Valley Gas Corp., Farmington, N. M.:		
Building plant in Lea County, New Mexico	5 M.M.c.f.	Aug. '55

Ammonia manufacture . . .

MULTISTAGE COMPRESSORS are used to compress synthesis gas at Lion Oil Co.'s Barton plant making ammonia near New Orleans.

. . . and biggest-volume end use

NURSE TRUCK, carrying 1,200 gal. of aqua ammonia, refilling a trailer fertilizing unit.

NH_3, Polyethylene Head Petrochemical Construction

by John C. Reidel
Petrochemical Editor

POLYETHYLENE and ammonia—these two petrochemicals continue to hold a dominant position in actual building of new facilities and in future planning.

Other specific projects of interest are the expansion of Shell Chemical Co. capacity for manufacture of chlorohydrins and allyl chloride at Norco, La. At this location Shell is now building facilities to make glycerin via acrolein. Meanwhile Dow Chemical Co. is nearing completion of a 36,000,000-lb. per year glycerin plant at Velasco, Tex.

Polyethylene boom . . . This continues *(The Oil and Gas Journal, May 9, 1955, page 80)*. At the time of writing, Dow Chemical at Freeport, Tex., should be coming into production, and also Koppers Co. at Port Arthur, Tex. Starting with the Texas Eastman plant at Longview, Tex., late in 1954, the following polyethylene facilities have been completed in rapid order this year: Carbide & Carbon Chemical Co., at Seadrift, Tex.; Monsanto Chemical Co., at Texas City; Spencer Chemical Co., at Orange, Tex.; and National Petrochemicals at Tuscola, Ill.

Nearing completion at Port Arthur is Gulf Oil Corp.'s expansion of its ethylene facilities. The new ethylene unit should be on stream quite soon.

Next in the parade of polyethylene and ethylene-manufacturing facilities to be constructed are those of Phillips Chemical Co. This company has announced an ethylene plant adjoining its refinery at Sweeny, Tex., to be tied in with a polyethylene plant on the Houston Ship Channel. A low-pressure process will be employed to make polyethylene.

Ammonia . . . Beyond the expectation of many people, ammonia construction projects and plans for still more projects continue to roll along. Strong impetus for construction of more ammonia facilities comes from existence of large supplies of byproduct hydrogen from catalytic reforming. New ammonia projects being built or planned which will employ hydrogen from this source include Calumet Nitrogen Products Co. (Standard of Indiana and Sinclair); Standard Oil Co. of Ohio (cat reformer provides part of total hydrogen); Sun Oil Co.; and Standard Oil Co. of California. These plants each have capacities in the order of 300 tons per day of anhydrous ammonia.

Listed in the table are other ammonia products which derive their hydrogen from nonpetrochemical sources. These are included in order to present a full picture of ammonia-plant construction.

Journal Survey of Petrochemical-Plant Construction

Plant and location—	Date of completion
Allied Chemical & Dye Corp., Moundsville, W. Va.:	
Building hydrogen and carbon monoxide plant (to be used in organic synthesis)	Jan. 1956
Ammonia Chemical Corp. of California, Merced, Calif.:	
Planning $3,250,000 anhydrous ammonia plant	
Atlas Powder Co.:	
Company has ODM writeoff to build an anhydrous ammonia and a glycerin plant. Plant location has not been chosen	
Brea Chemicals, Inc., Brea, Calif.:	
Building nitric acid and ammonium nitrate plant. 120 T/D	Aug. 1955
Calumet Nitrogen Products Co., Hammond, Ind.:	
Building anhydrous ammonia plant and facilities to produce nitrogen solutions and ammonium nitrate. 300 T/D	May 1956
Carbide & Carbon Chemical Co., Torrance, Calif.:	
Polyethylene (and ethylene glycol) facilities. 60,000,000 lb./year	1956
Columbia River Chemicals, Inc., Pasco, Wash.:	
Building $12,000,000 anhydrous ammonia (160 T/D), urea (110 T/D), and ammonia solutions (140 T/D)	Late 1955
Columbian Carbon Co., Franklin, La.:	
Completing work on oil-black plant. Part of design capacity began operations in November. 20,000,000 lb./year	Late 1955
Commercial Solvents Corp., Sterlington, La.:	
Building $5,000,000 nitroparaffin plant. Company is also enlarging its existing facilities at Peoria, Ill., for nitroparaffin derivatives. 10,000,000 lb./year	Aug. 1955
Consolidated Chemical Industries, Inc., Houston:	
Completing work on a $3,500,000 sulfuric acid plant to recover sulfuric acid from heavy acid sludge at Sinclair's refinery. 400 T/D	Aug. 1955
Dow Chemical Co., Velasco, Tex.:	
Synthetic glycerin plant. 36,000,000 lb./year	Aug. 1955
Dow Chemical Co., Torrance, Calif.:	
Adding to styron plant	Dec. 1955
Dow Chemical Co., Freeport, Tex.:	
Nearing completion, polyethylene, 25,000,000 lb./year	1955
E. I. du Pont de Nemours & Co., Inc., Belle, W. Va.:	
Constructing ammonia plant	1956
Du Pont, Parkersburg, W. Va.:	
Expanding tetrafluoroethylene facilities	
Du Pont, Louisville, Ky.:	
Increasing fluorinated hydrocarbon capacity	Late 1955
Gonzales Chemical Industries, Inc., San Juan, Puerto Rico:	
Planning anhydrous ammonia plant. 120 T/D	
B. F. Goodrich Chemical Co., Shelton, Conn.:	
Building carbon dioxide plant. 25 T/D	Aug. 1955
B. F. Goodrich Chemical Co., Louisville:	
Expanding synthetic rubber facilities	1956
Goodyear Rubber Co., Houston:	
Expanding polymer facilities	Sept. 1955
Escambia Bay Chemical Corp., Pensacola, Fla.:	
Company planning an ammonia (200 T/D) and polyvinyl (40 T/D) plant	1956
Gulf Oil Co., Port Arthur, Tex.:	
Completing new ethylene unit. 3,000,000,000 cu. ft./year	Aug. 1955
Hercules Powder Co., Burlington, N. J.:	
Dimethyl terephthalate. 12,000,000 lb./year	(Sched. May 1955)
Heyden Chemical Co. (see Monsanto Chemical Co.)	
Hidalgo Chemical Co. (formerly Carthage Hydrocol, Inc.), Brownsville, Tex.:	
Revamping hydrocarbon synthesis plant	1956
Ketona Chemical Co., Ketona, Ala. (Hercules Powder Co. and Alabama By-Products Corp.):	
Building anhydrous ammonia plant (hydrogen from coke operation). 45,000 T/year	Late 1955
Nitric acid facilities. 60 T/D	Feb. 1956
Ammonium nitrate plant. 120 T/D	Feb. 1956
Koppers Co., Inc., Port Arthur, Tex.:	
Completing work on polyethylene plant	Aug. 1955
Lynn Carbon Black Co., San Angelo, Tex.:	
Planning carbon black plant to use the Lynn "Furmatic" process. Company also has plans for five additional plants	
Mississippi River Fuel Co., Crystal City, Mo.:	
Building ammonia plant. 200 T/D	Oct. 1955
Monsanto Chemical Co., Springfield, Mass.:	
Building styrene plant and research facilities	
Monsanto Chemical Co. & Heyden Chemical Co., Texas City, Tex.:	
Methanol unit	1955
Northern Chemical Industries, Searsport, Me.:	
Ammonia plant. 125 T/D	Spring 1956
Nitric acid plant. 60 T/D	Spring 1956
Nitrogen solutions	Spring 1956
Sulfuric acid plant, 100 T/D	Jan. 1956
Petro-Tex Chemical Corp., Houston:	
Planned expansion of butadiene plant	1956
Phillips Chemical Co., Sweeny, Tex.:	
Building ethylene plant. 145,000,000 lb./year	1956
Phillips Chemical Co., Pasadena, Tex.:	
Building polyethylene plant, 100,000,000 lb./year	1956
Sharples Chemicals, Inc., Houston, Tex. (Index Chemicals Co.):	
Thiophene plant	Summer 1955
Shell Chemical Co., Norco, La.:	
Installing units to make hydrogen peroxide and acrolein for conversion to glycerin. 30,000,000 lb./year	1956
(Chlorohydrins and allyl chloride facilities completed.)	
Shell Chemical Co., Martinez, Calif.:	
Expanding Ionol plant	Late 1955
Simpson Coal & Chemical Co., Natchez, Miss.:	
Planning a natural-gas acetylene plant integrated with an ammonia plant, 30,000 T/year, 60,000 T/year	Summer 1956
Sinclair Chemicals, Inc., Marcus Hook, Pa.:	
Completing toluene, p-xylene plant. 10,000,000 lb./year of p-xylene	1955
Southwest Agrochemical Corp., Phoenix:	
Planning ammonia plant. 25 T/D	
Spencer Chemical Co., Henderson, Ky.:	
Completing work on nitric acid, ammonium nitrates, fertilizer. 120 T/D	Aug. 1955
Spencer Chemical Co., Vicksburg, Miss.:	
Beginning construction on additional acid and nitrate facilities. 120 T/D	Spring 1956
St. Paul Ammonia Products Co., St. Paul:	
Planning anhydrous ammonia, ammonium nitrate plant. 200 T/D	May 1956
Standard Oil Co. of Ohio, Lima, Ohio:	
Building an anhydrous ammonia (300 T/D), nitric acid (60 T/D), nitrogen solution (200 T/D), and urea plant (120 T/D)	Nov. 1955
Sun Oil Co., Marcus Hook, Pa.:	
Building anhydrous ammonia plant. 300 T/D	Nov. 1955
Standard Oil Co. of California, Richmond, Calif.:	
Planning ammonia plant. 270 T/D	Summer 1956
Planning nitric acid plant. 225 T/D	Summer 1956
Building isophthalic plant. 50,000,000 lb./year	Oct. 1955
Texas Butadiene & Chemical Corp., Settegast, Tex.:	
Building plant to make aviation alkylates, butylenes and butadiene	1956
Texas Eastman Co., Longview, Tex.:	
Expanding existing Oxo facilities and adding facilities for propyl aldehydes, amyl aldehydes, and decyl alcohols	1956
Thunderbird Corp., undecided location in Arizona:	
Proposes a combination refinery and ammonia plant	
Union Carbide & Carbon Corp., Leaksville, N. C.:	
Planning dynel fiber plant	
United States Steel Corp., Geneva, Utah:	
Planning anhydrous ammonia plant, coke byproduct hydrogen. 200 T/D	1956
Utah Chemical Co., Salt Lake:	
Planning anhydrous ammonia plant. 280 T/D	Late 1955
Westvaco Division, Food Machinery & Chemical Corp., Charleston:	
Building ammonia plant. 60 T/D	Late 1955
(Electrolytic cell byproduct hydrogen.)	

U. S. Petroleum Industry Financial Data (Millions of Dollars)

	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954
GROSS ASSETS EMPLOYED										
Current assets	4,600	4,700	4,800	5,500	6,300	7,500	8,100	8,600	9,000	9,150
Fixed assets	16,600	17,700	19,600	21,700	23,500	25,000	27,400	30,700	33,600	37,500
Other assets	300	300	300	400	400	400	500	700	600	550
Total	**21,500**	**22,700**	**24,700**	**27,600**	**30,200**	**32,900**	**36,000**	**40,000**	**43,200**	**47,200**
GROSS INVESTMENT IN FIXED ASSETS										
Crude and natural gas	8,500	9,100	9,900	10,925	12,050	13,150	15,000	16,975	18,625	21,500
Gasoline and cycling plants	400	425	525	600	725	750	550	675	775	800
Total Drilling-Production	**8,900**	**9,525**	**10,425**	**11,525**	**12,775**	**13,900**	**15,550**	**17,650**	**19,400**	**22,300**
Pipelines	1,225	1,325	1,450	1,650	1,800	1,850	2,050	2,425	2,700	2,950
Marine	1,000	1,050	1,100	1,150	1,150	1,100	1,100	1,025	1,050	1,025
Tank cars and motor transport	275	300	300	325	350	350	350	350	350	325
Total Transportation	**2,500**	**2,675**	**2,850**	**3,125**	**3,300**	**3,300**	**3,500**	**3,800**	**4,100**	**4,300**
Refineries and chemical plants	2,900	3,000	3,600	4,150	4,375	4,600	4,750	5,300	5,850	6,400
Marketing	2,100	2,250	2,475	2,600	2,750	2,900	3,200	3,450	3,700	4,000
Others	200	250	250	300	300	300	400	500	550	500
Total	**16,600**	**17,700**	**19,600**	**21,700**	**23,500**	**25,000**	**27,400**	**30,700**	**33,600**	**37,500**
CAPITAL EXPENDITURES										
Crude and natural gas		1,315	1,700	2,000	1,890	2,025	2,575	3,125	3,400	3,700
Gasoline and cycling plants		35	50	100	110	75	75	75	125	100
Total Drilling-Production		**1,350**	**1,750**	**2,100**	**2,000**	**2,100**	**2,650**	**3,200**	**3,525**	**3,800**
Pipelines		105	170	210	175	200	250	335	325	275
Marine		60	125	100	75	15	35	50	100	50
Tank cars and motor transport		5	15	15	20	10	15	15	25	25
Total Transportation		**170**	**310**	**325**	**270**	**225**	**300**	**400**	**450**	**350**
Refineries and chemical plants		250	400	600	420	275	325	470	675	800
Marketing		200	300	225	240	275	300	280	325	350
Others		30	65	100	70	50	50	50	50	50
Total		**2,000**	**2,825**	**3,350**	**3,000**	**2,925**	**3,625**	**4,400**	**5,025**	**5,350**

Petroleum Investments

by Frederick G. Coqueron
Chase Manhattan Bank, New York

IN terms of capital investment, the petroleum business is considered one of the largest in the country. It is estimated by Chase Manhattan Bank that the combined assets employed by the industry as a whole amounted to 47 billion dollars at the end of 1954.

The main components consist of: gross fixed assets—79.4 per cent; current assets—19.4 per cent; other assets—1.2 per cent. Gross fixed assets amounting to 37.5 billion dollars represent the industry's investment in property, plant and equipment.

Distribution by departments is as follows: **production—59.4 per cent; transportation—11.5 per cent; refining—17.1 per cent; marketing and other facilities—12.0 per cent.**

For several years, Chase Manhattan has presented annual estimates of capital expenditures by the entire industry in the United States. A further study was undertaken during 1954 of the figures furnished by the companies included in this survey and also data for the rest of the industry. Consideration was given primarily to the average cost of drilling wells by companies, grouped according to volume of crude-oil production as large, medium, or small. The outlay for lease purchases and lease facilities was also reviewed. The findings disclosed that the figures published in 1953 covering capital expenditures by the entire industry have been understated for the years 1946-1953. The previous estimates have been revised to conform with the more accurate approach, as shown below (in millions of dollars):

Year	Production	Other departments	Combined
1946	1,350	650	2,000
1947	1,750	1,075	2,825
1948	2,100	1,250	3,350
1949	2,000	1,000	3,000
1950	2,100	825	2,925
1951	2,650	975	3,625
1952	3,200	1,200	4,400
1953	3,525	1,500	5,025
Total—Revised	**18,675**	**8,475**	**27,150**
Original	16,975	8,475	25,450
Increase	**1,700**	**0**	**1,700**

Based on funds invested by 35 representative oil companies and projects undertaken by the remainder of the industry, it is estimated that combined capital expenditures in the entire United States amounted to 5.4 billion dollars in 1954 compared with the yearly average of 3.4 billion for 1946-1953. A functional distribution of this outlay is presented in the following table:

	Million dollars	Per cent of total
Production	3,800	71.0
Transportation	350	6.5
Manufacturing	800	15.0
Marketing	350	6.5
Others	50	1.0
Total	**5,350**	**100.0**

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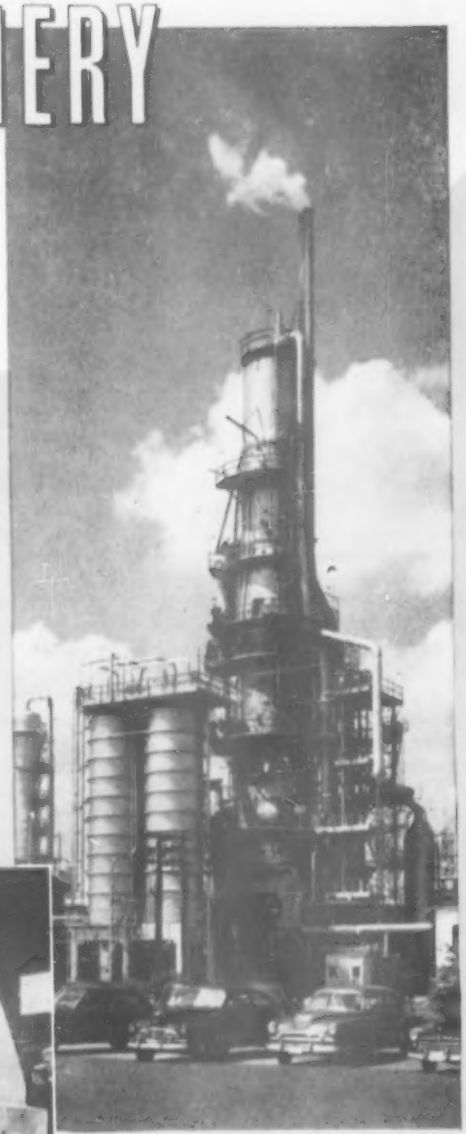
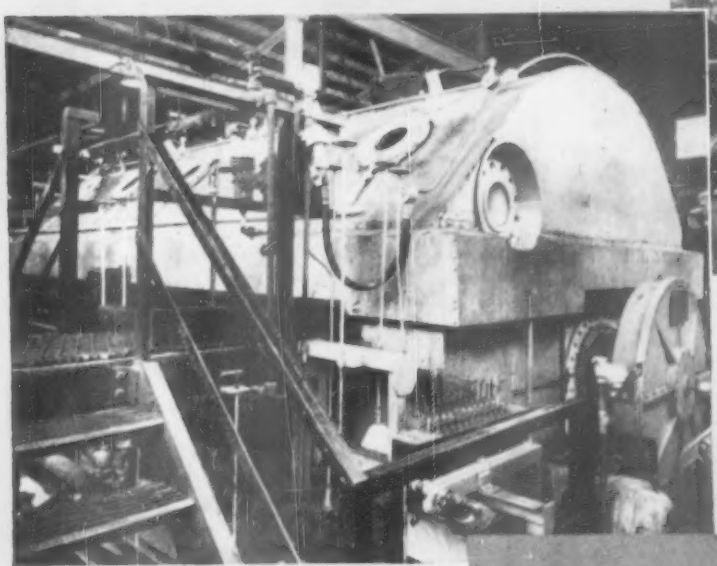


FLUID CAT CRACKER

CB&I built the reactor-regenerator and catalyst hoppers for the UOP fluid catalyst cracking unit shown above at the Rock Island Refinery Corp., Zionsville, Indiana, refinery.



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Here's an accurate method for making

Gas-Pipeline-Network Flow Calculations

The network flow-analysis method described in this article can save you thousands of dollars by eliminating wasted horsepower. It did for T.G.T. The method was used in predicting performance of compressor-yard piping designs at three stations. The studies pointed up needed changes in the design and resulted in a pressure-drop saving equivalent to 2,319 hp. This saving was made at a total cost of $363,000. So in effect, T.G.T., gained an engine at about half the installed cost of one.

by C. H. Klohn

WITH increasing sales of natural gas, piping design in compressor-station yards has become complicated by the existence of more than one compressor building. In most cases the yard piping serving these buildings has developed into an intricate flow network.

Existing methods of design and analysis of these networks depend upon past experience, precedent, and rules of thumb. Since costs of construction and operation have been increasing, a need for a more precise method of economical design is apparent.

That more precise method is supplied by an adaptation of the Cross analysis of network flow. This method was first published in November 1936 by the University of Illinois Engineering Experiment Station in Bulletin No. 286. It was developed by Hardy Cross, then a professor of structural engineering.

Having been used very successfully in design of water distribution and other networks, it has now, by actual test, proved itself in the natural-gas industry by an adaptation to problems of compressible flow.

Station piping network . . . Fig. 1 shows a schematic line diagram of one of Tennessee Gas Transmission Co.'s compressor stations near Natchitoches, La. This schematic shows the piping arrangement prior to changes made in 1954.

Three main lines, one 24-in. and two 30-in., carry gas to the suction side of the station. Two large high-pressure feeder lines dump gas into the discharge piping network and four main lines carry the gas from the station.

Equalizing headers at each end of the station collect and distribute the flow.

Problem resulting from network . . . In such a station, a large variation of horsepower requirements is possible, even though throughput, temperatures, pressures, and station-header compression ratios remain constant. The variation is caused by changing the relative proportion of the total flow which is compressed by each engine room.

The design problem is to find the best arrangement and size of piping to serve each individual compressor building, and make these buildings integral parts of a station operating at an optimum condition.

The author contends that too little attention has been paid to the design of the station yard for two reasons: (1) A real analysis has been, to say the least, complicated. (2) It has been incorrectly assumed that yard piping is not important, since the pressure loss through the yard is such a small percentage of the pressure loss through the main lines.

Development of Pressure Loss Formula

A mathematical relationship between pressure loss, pipe diameter, flow quantity and other variables was necessarily developed. It was then used with an adaptation of the Cross method of analysis.

The Fanning (or Darcy) equation states:

$$h = f \frac{L}{d} \frac{V^2}{2g} \qquad (1)$$

where:

- h = loss of head in feet of fluid
- f = "friction factor," a function of Reynolds number
- L = length of the conduit, ft.
- d = inside diameter of the conduit, ft.
- V = mean velocity of flow, ft. per second
- g = acceleration due to gravity, taken to be 32.2 ft. per second, per second

Accepting a value of 0.0764 lb. per cubic foot for air at 14.696 psia. and

What you can do with this method of flow analysis:

The method given here may be used to design piping for compressor stations, process plants, or gathering networks. By using the method it is possible to:

- Determine flow
- Determine pressure loss
- Find over-all efficiency
- Predict performance of design
- Uncover "parasitic" pressure losses

To make calculations the engineer needs only:

- An inventory of pipe sizes, pipe lengths, types of fittings, etc.
- Approximate flow in and out of various parts of the network
- Approximate operating pressures and temperatures.

The calculations can be made simply and quickly. The results are in perfect order for inspection at any time.

60° F., the specific weight, w, of a gas is:

$$w = 0.0764\ G \frac{P}{TZ_f} \frac{520}{14.696}$$

$$= 2.7033 \frac{GP}{TZ_f} \qquad (2)$$

and:

$$h = \frac{\Delta P}{w} = \frac{144\ \Delta P\ TZ_f}{2.7033\ GP}$$

$$= \frac{53.268\ \Delta P\ TZ_f}{GP} \qquad (3)$$

where:

ΔP = loss of head, psi.
T = actual gas temperature, °R.
Z_f = compressibility factor (deviation from Boyle's law, see Fig. 2).
G = specific gravity of gas (with respect to air = 1)
P = actual pressure, psia.

Obtaining V in terms of millions of standard cubic feet per day:

$$V = \frac{\pi}{4} \frac{1{,}000{,}000}{86{,}400} \frac{QTZ_fP_B}{d^2PT_B}$$

$$= 14.736 \frac{QTZ_fP_B}{d^2PT_B} \qquad (4)$$

where:

Q = M.M.s.c.f.d. measured at a pressure base of P_B, psia., and a temperature base of T_B, °R.

Substituting (3) and (4) in (1) and solving for ΔP:

$$\Delta P = 0.063298\ GLf \frac{TZ_f}{P}$$

$$\times (P_B/T_B)^2\ (Q^2/d^5) \qquad (5)$$

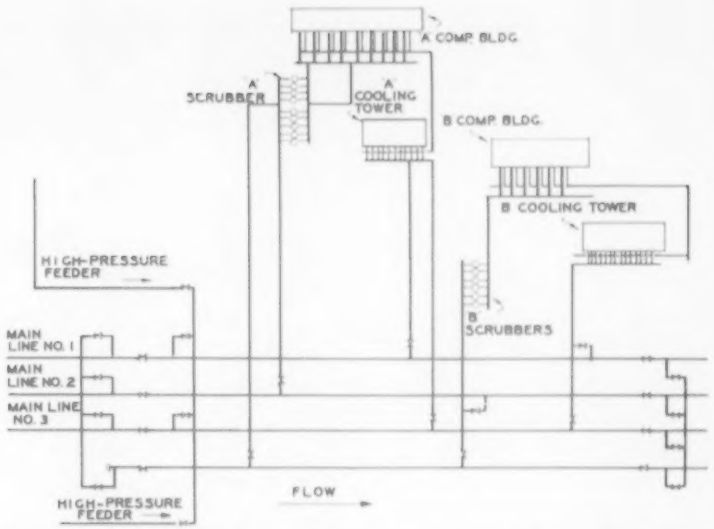
Converting d to inches (d = D/12), and using 100 ft. for L:

$$\Delta P = 1{,}575{,}000\ Gf \frac{TZ_f}{P}$$

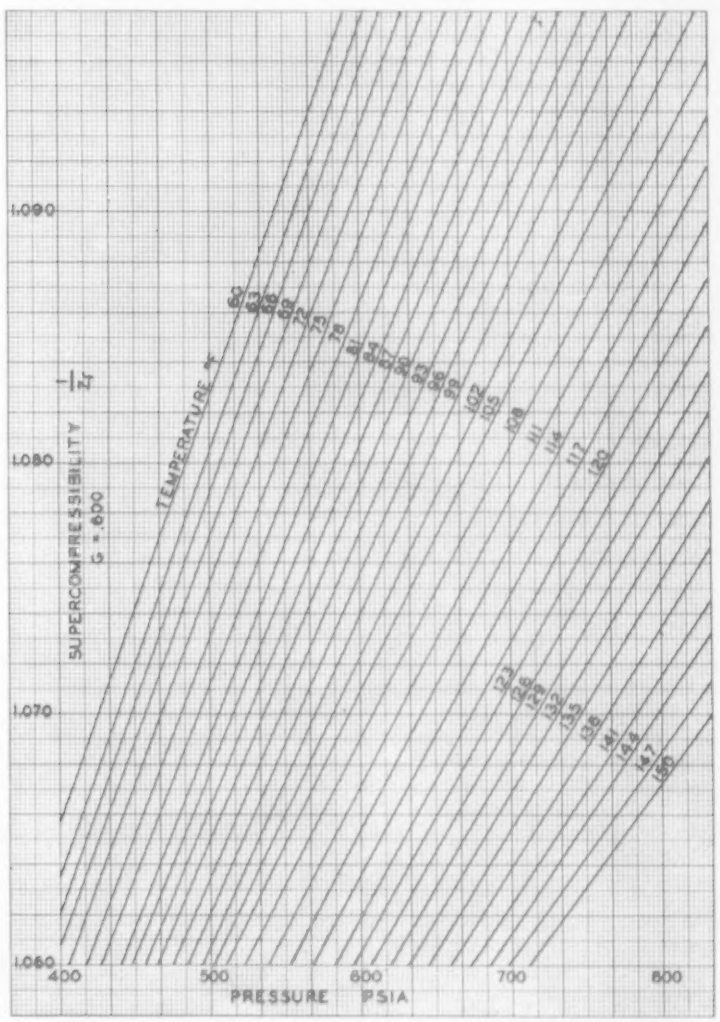
$$\times (P_B/T_B)^2\ (Q^2/D^5) \qquad (6)$$

Friction factor . . . An expression for friction factor, covering a wide range of Reynolds numbers and pipe diameters in a simple, easy-to-use form, is next to impossible and until such an expression is developed, the engineer has to rely upon empirical expressions, corresponding to his range of interest.

Approximating the charts of Pigott,[1]



SCHEMATIC DIAGRAM of T.G.T.'s Station 40 in 1954 prior to construction changes. Fig. 1.



SUPERCOMPRESSIBILITY FACTOR, $1/Z_f$, for 0.600-gravity gas. Fig. 2.

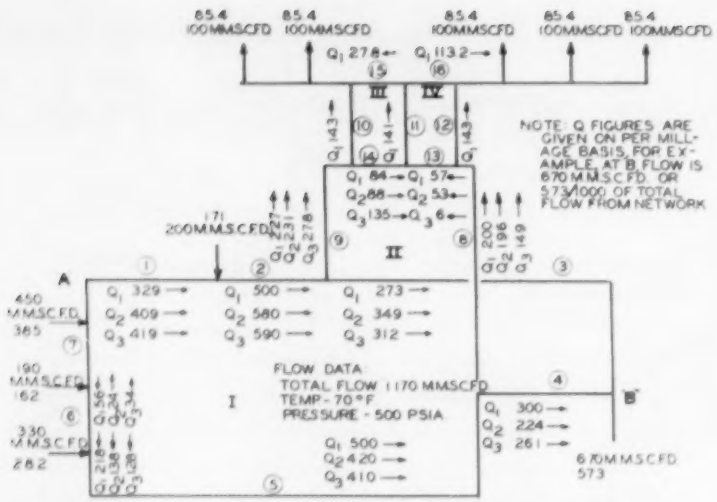


DIAGRAM OF NETWORK used in sample problem calculations. Note Q values are on a permillage basis. Fig. 3.

Engineering at Midyear

with confirmation by rather limited data on company pipelines between the ranges of Reynolds numbers of 5,000,000 to 17,000,000, gives:

$$f = 0.0317\ N_R^{-0.125} \qquad (7)$$

where:

N_R = Reynolds number in thousands

Using (2) as the expression for specific weight, (4) as the expression for velocity, and assuming 0.0000085 lb. per ft.-second as an average viscosity:

$$N_R \text{ (in thousands)} = 56{,}239\ \frac{GQP_B}{DT_B} \qquad (8)$$

Then from (7):

$$f = 0.008078\ (DT_B/GQP_B)^{0.125} \qquad (9)$$

Substitution of (9) in (6):

$$\Delta P = 12{,}723\ E\ (TZ_f/P)\ (P_B/T_B)^{1.875} \times G^{0.875}\ \frac{Q^{1.875}}{D^{4.875}} \qquad (10)$$

where:

ΔP = pressure loss in psi. per 100 ft. of pipe
E = "experience" factor, depending largely upon the condition of the interior of the pipe
T = actual average temperature, °R.
Z_f = compressibility factor
P = actual average pressure, psia.
P_B = pressure base, psia.
T_B = temperature base, °R.
G = specific gravity of the gas
Q = M.M.s.c.f.d. measured at P_B and T_B
D = inside diameter of pipeline, in.

The Hardy Cross method . . . Flow networks have been solved by the use of the electrical analogy, by model studies, and by just "educated guessing." The two former methods are expensive and time consuming while the latter may or may not yield satisfactory results.

The Cross method, since its publication in 1936, has become popular with engineers and operators concerned with water-distribution problems, such as occur in complex city water systems. It has consistently produced highly satisfactory results in this and in other fields of industry.

The fundamental assumptions are the following:

1. Continuity of flow—The total flow reaching any junction equals the total flow leaving it.

2. Continuity of potential—The pressure at the entrance to the network equals the pressure at the exit, less the pressure loss through any available route between entrance and exit. That is, the flow will divide of itself through the various available routes, taking the path of least resistance.

Reducing Equation 10 to the general form, we have:

$$\Delta P = KQ^n \qquad (11)$$

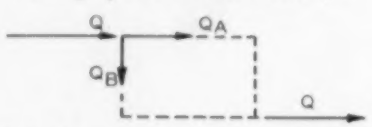
where:

$K = 12{,}723\ E\ (TZ_f/P)\ (P_B/T_B)^{1.875}\ (G^{0.875}/D^{4.875})$

and:

$n = 1.875$

Setting up a flow circuit below,



Q is the actual flow approaching the junction, and Q_A and Q_B is an **assumed** distribution through the available routes.

THE AUTHOR

C. H. Klohn joined Tennessee Gas Transmission Co. in 1950 and is now an engineer in the operating research section of T.G.T. He graduated from Rensselaer Polytechnic Institute in 1949 and worked 1 year with the Ohio State Department of Highways. He is a licensed professional civil engineer.

From the basic assumption, then:

$$Q = Q_A + Q_B \qquad (12)$$

and

$$\Delta P_A - \Delta P_B = 0 \qquad (13)$$

If we let ΔQ be an incremental part of Q (a corrective increment which will correct the assumed Q_A and Q_B as to distribution) applied in a clockwise direction as plus and in a counterclockwise direction as minus, then from (12):

$$Q = (Q_A + \Delta Q) + (Q_B - \Delta Q) \qquad (14)$$

and, from (11):

$$\Delta P_A = K\ (Q_A + \Delta Q)^n \text{ and}$$

$$\Delta P_B = K\ (Q_B - \Delta Q)^n \qquad (15)$$

Then from (13):

$$\Delta P_A - \Delta P_B = 0 = K\ (Q_A + \Delta Q)^n - K\ (Q_B - \Delta Q)^n \qquad (16)$$

The series is developed:

$$K\ (Q_A^n + \Delta Q n Q_A^{n-1} + \ldots) - K\ (Q_B^n - \Delta Q n Q_B^{n-1} + \ldots) = 0 \qquad (17)$$

Since the numerical value of n is 1.875, any additional terms of the series, n − 2, n − 3, etc., would become smaller and smaller. Also if ΔQ was small as compared to Q_A or Q_B, no appreciable error will be introduced by neglecting additional terms. For practical purposes, then, upon combining the terms, the equation becomes:

$$KQ_A^n + K\Delta Q n Q_A^{n-1} - KQ_B^n + K\Delta Q n Q_B^{n-1} = 0 \qquad (18)$$

This equation is simplified and solved for ΔQ, the correction increment:

$$\Delta Q = -\ \frac{KQ_A^n - KQ_B^n}{n\ (KQ_A^{n-1} + KQ_B^{n-1})} \qquad (19)$$

By making the substitutions in the numerator:

$$\Delta P_A = KQ_A^n \text{ and } \Delta P_B = KQ_B^n$$

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TABLE 1—LIST OF EQUIVALENT LENGTHS FOR SAMPLE PROBLEM

(Lengths are in feet.)

Pipe No.	Pipe size (i.d.)	Length of pipe	90° Ells		Tees (thru barrel)		Tees (thru branch)		Plug valves		Other		Total equiv. length
			No.	Equiv. length	No.	Equiv. length	No.	Equiv. length	No.	Equiv. length	Description	Equiv. length	
1	25	300	2	52	2	64			1	515			931
2	28.25	200			2	74					26 x 28 Expander	Nil	274
3	28.25	500	1	30	2	74			1	833			1,437
4	23	150					2	210					360
5	23	600	4	100	2	60			1	270	26 x 24 Reducer	Nil	1,030
6	25	50			2	64							114
7	25	50			2	64							114
8	23	300	1	25	2	60							385
9	23	200	1	25	1	30	1	105					360
10	15	20	2	32			2	140			Scrubber	400	592
11	15	20	2	32			2	140			Scrubber	400	592
12	15	20	2	32			2	140			Scrubber	400	592
13	23	20			2	60							80
14	23	20			2	60							80
15	23	20			2	60							80
16	23	20			2	60							80

and in the denominator:

$$\frac{\Delta P_A}{Q_A} = KQ_A^{n-1} \text{ and } \frac{\Delta P_B}{Q_B} = KQ_B^{n-1}$$

where ΔP_A and ΔP_B are the pressure losses computed from the **assumed** flows Q_A and Q_B.

The equation then becomes:

$$\Delta Q = -\frac{\Delta P_A - \Delta P_B}{n(\Delta P_A/Q_A + \Delta P_B/Q_B)} \quad (20)$$

If the algebraic summation of the individual ΔP's through the circuit is represented by $\Sigma\Delta P$ and the sum of the $\Delta P/Q_{A,B}$ terms by $\Sigma(\Delta P/Q_n)$, the equation then becomes:

$$\Delta Q = -\frac{\Sigma\Delta P}{n\Sigma(\Delta P/Q_n)} \quad (21)$$

Simplified Sample Calculation

The network to be analyzed is set up as a schematic line diagram, Fig. 3.

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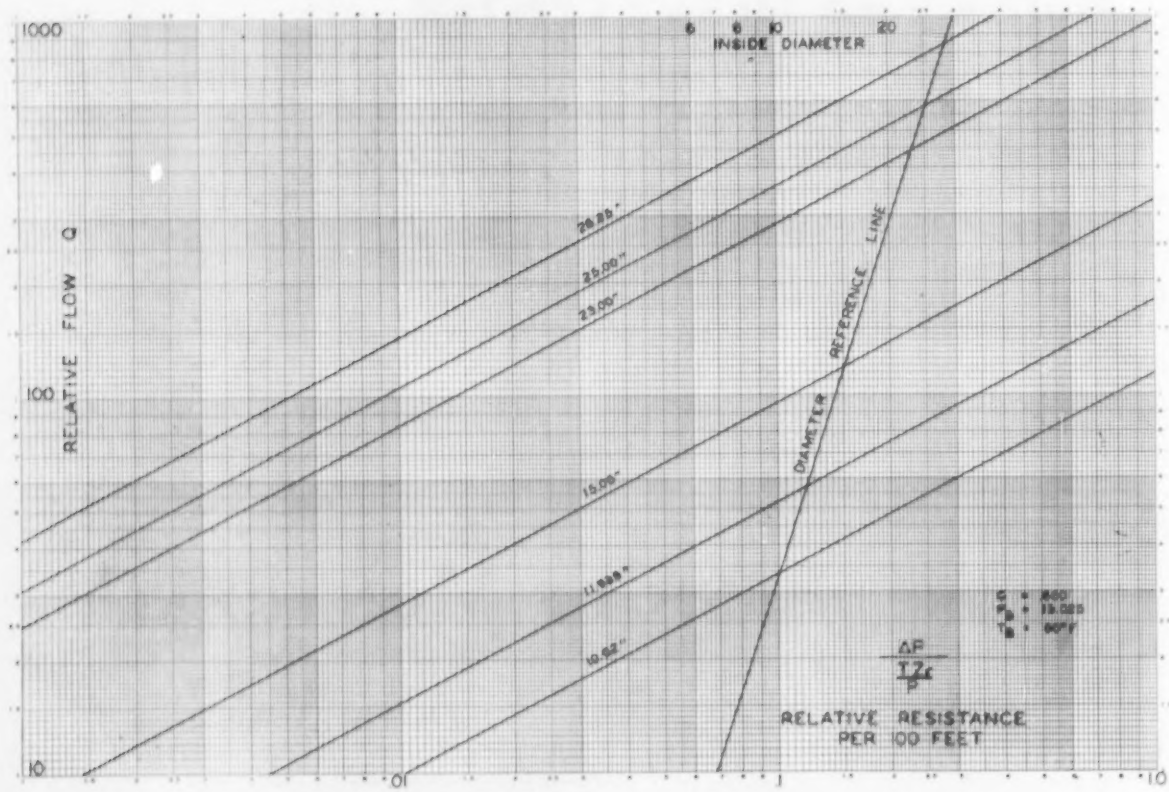
Each closed piping circuit and each pipe leg of that circuit is numbered. The sizes and lengths of the pipe leg are tabulated, taking into consideration valves, fittings, etc., Table 1. (Equivalent lengths may be obtained from Tube-Turns, Inc.,[2] or other like authority.)

The permillage flow (called the relative flow) into and out of the network is calculated on the basis of 1,000 parts,



NOMOGRAPH for solution of Equation 10. Fig. 4.

Table 2 – Work Sheet for Sample Problem

(Note: Unless indicated by minus sign (—), all values are positive)

CIRCUIT NO. 1

Pipe No.	Pipe size	L length (hundreds of feet)	Q_1 Relative flow	R_1 relative resistance per 100 ft.	$L \times R_1$ ΔP_1	$\Delta P_1 / Q_1$
1	25	9.31	329	0.086	0.801	0.00243
2	28.25	2.74	500	0.104	0.285	0.00057
3	28.25	14.37	273	0.0332	0.477	0.00175
4	23	3.60	—300	0.11	—0.396	0.00132
5	23	10.30	—500	0.285	—2.936	0.00587
6	25	1.14	—218	0.0395	—0.045	0.00021
7	25	1.14	— 56	0.00305	—0.003	0.00005
					Σ—1.817	Σ0.01220

$$\Delta Q_1 = -\frac{-1.817}{1.875 \times 0.01220} = +79.4 \text{ (say 80)}$$

ΔQ_1	Q_2 Relative flow	R_2 relative resistance per 100 ft.	$L \times R_2$ ΔP_2	$\Delta P_2 / Q_2$	ΔQ_2	Q_3 Relative flow	R_3 relative resistance per 100 ft.	$L \times R_3$ ΔP_3
80	409	0.129	1.201		10	419	0.135	1.257
80	580	0.139	0.381		10	590	0.143	0.392
80 — 4	349	0.053	0.762		10 — 47	312	0.0435	0.625
80 — 4	—224	0.063	—0.227		10 — 47	—261	0.0845	—0.304
80	—420	0.205	—2.112		10	—410	0.197	—2.029
80	—138	0.0165	—0.019		10	—128	0.0145	—0.017
80	24	Nil	Nil		10	34	0.0012	0.001
			Σ—0.014					Σ—0.075

ΔQ_2 negligible (but say +10 to counteract correction from Circuit 2)

CIRCUIT NO. 2

Pipe No.	Pipe size	L length (hundreds of feet)	Q_1 Relative flow	R_1 relative resistance per 100 ft.	$L \times R_1$ ΔP_1	$\Delta P_1 / Q_1$
9	23	3.60	227	0.065	0.234	0.00103
14	23	0.80	84	0.01	0.008	0.00010
13	23	0.80	— 57	0.0048	—0.004	0.00007
8	23	3.85	—200	0.051	—0.196	0.00098
4	23	3.60	300	0.11	0.396	0.00132
3	28.25	14.37	—273	0.0332	—0.477	0.00175
					Σ—0.039	Σ0.00525

$$\Delta Q_1 = -\frac{-0.039}{1.875 \times 0.00525} = +3.9 \text{ (say 4)}$$

ΔQ_1	Q_2 Relative flow	R_2 relative resistance per 100 ft.	$L \times R_2$ ΔP_2	$\Delta P_2 / Q_2$	ΔQ_2	Q_3 Relative flow	R_3 relative resistance per 100 ft.	$L \times R_3$ ΔP_3
4	231	0.067	0.241	0.00104	47	278	0.095	0.342
4	88	0.0108	0.009	0.00010	47	135	0.0243	0.019
4	— 53	0.00415	—0.003	0.00006	47	— 6	Nil	Nil
4	—196	0.049	—0.189	0.00096	47	—149	0.0292	—0.112
4 — 80	224	0.0625	0.225	0.00100	47 — 10	261	0.0845	0.304
4 — 80	—349	0.0525	—0.754	0.00216	47 — 10	—312	0.0435	—0.625
			Σ—0.471	Σ0.00532				Σ—0.072

$$\Delta Q_2 = -\frac{-0.471}{1.875 \times 0.00532} = +47.2 \text{ (say 47)}$$

CIRCUIT NO. 3

Pipe No.	Pipe size	L length (hundreds of feet)	Q_1 Relative flow	R_1 relative resistance per 100 ft.	$L \times R_1$ ΔP_1	$\Delta P_1 / Q_1$
10	15	5.92	143	0.213	1.261	0.00882
15	23	0.80	— 27.8	0.00125	—0.001	0.00004
11	15	5.92	—141	0.208	—1.231	0.00873
14	23	0.80	— 84	0.01	—0.008	0.00009
					Σ0.021	Σ0.01768

$$\Delta Q_1 = -\frac{0.021}{1.875 \times 0.01768} = -0.6 \text{ (negligible)}$$

ΔQ_1	Q_2 Relative flow	R_2 relative resistance per 100 ft.	$L \times R_2$ ΔP_2	$\Delta P_2 / Q_2$	ΔQ_2	Q_3 Relative flow	R_3 relative resistance per 100 ft.	$L \times R_3$ ΔP_3
	143	0.213	1.261			143	0.213	1.261
	— 27.8	0.00125	—0.001			— 27.8	0.00125	—0.001
	—141	0.208	—1.231			—141	0.208	—1.231
—4	— 88	0.0109	—0.009		—47	—135	0.0243	—0.019
			Σ0.020					Σ0.010

ΔQ_2 negligible

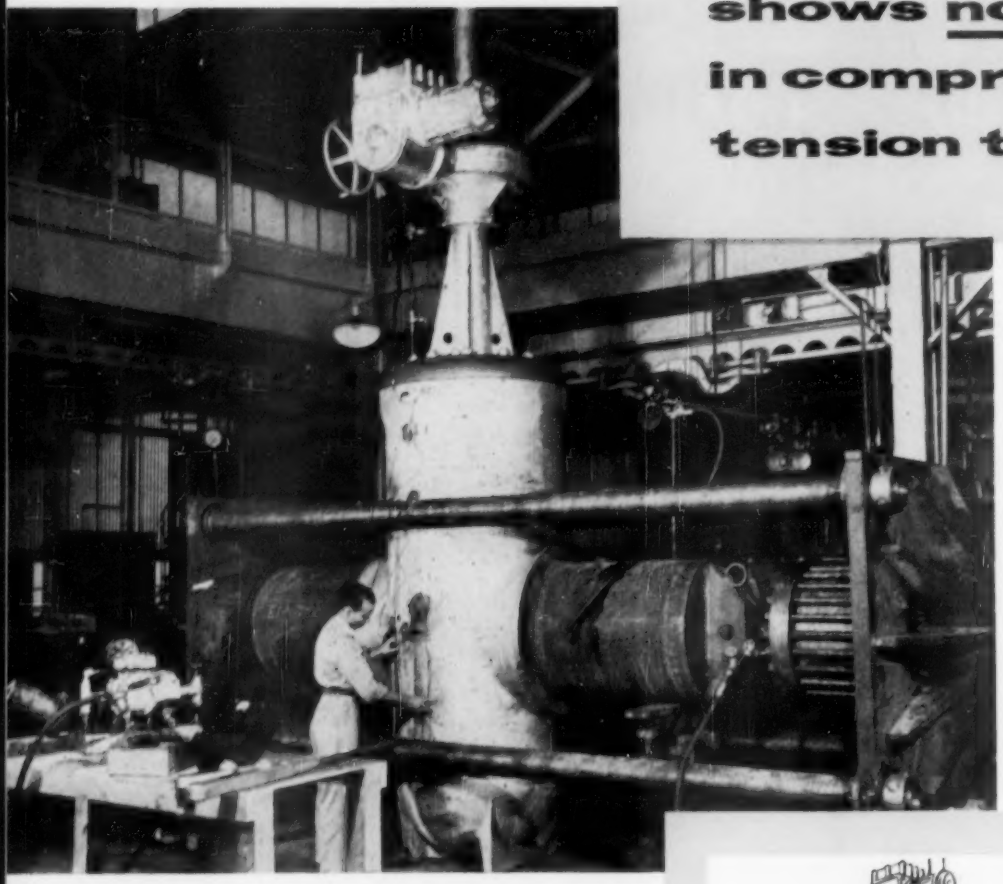
CIRCUIT NO. 4

Pipe No.	Pipe size	L length (hundreds of feet)	Q_1 Relative flow	R_1 relative resistance per 100 ft.	$L \times R_1$ ΔP_1	$\Delta P_1 / Q_1$
11	15	5.92	141	0.208	1.231	
16	23	0.80	113.2	0.0172	0.014	
12	15	5.92	—143	0.213	—1.261	
13	23	0.80	57	0.0048	0.004	
					Σ—0.012	

ΔQ_1 negligible

ΔQ_1	Q_2 Relative flow	R_2 relative resistance per 100 ft.	$L \times R_2$ ΔP_2	$\Delta P_2 / Q_2$	ΔQ_2	Q_3 Relative flow	R_3 relative resistance per 100 ft.	$L \times R_3$ ΔP_3
	141	0.208	1.231			141	0.208	1.231
	113.2	0.0172	0.014			113.2	0.0172	0.014
	—143	0.213	—1.261			—143	0.213	—1.261
—4	53	0.0042	0.003		—47	6	Nil	Nil
			Σ—0.013					Σ—0.016

W-K-M Valve shows no leak in compression-tension tests



A special test was made in the W-K-M plant to determine what effect external compression and tension loads would have on seal-off and operation of a W-K-M Valve.

This test was conducted using a 30" ASA 400 p.s.i. weld-end gate valve operated by an electric motor. Ten strain gages were placed in the valve at locations shown on the diagram at right.

Using a hydraulic cylinder, an external differential tension load of 675 tons was applied to the valve while maintaining maximum working pressure against the gate.

During the tests the recorded strain-gage readings indicated no fibre stresses in excess of code allowables, indicating no appreciable body distortion. The valve did not leak and operated freely under all conditions.

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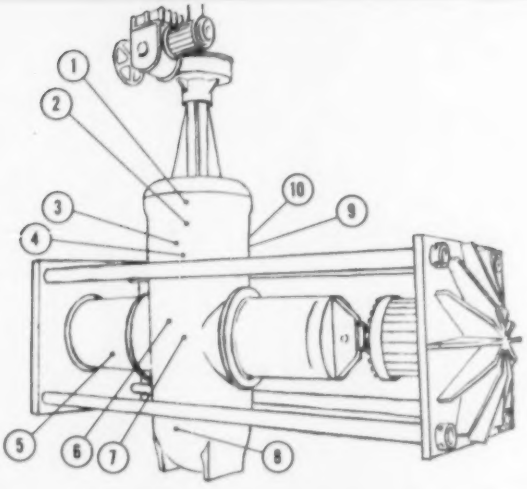

The above sketch shows the placement of the strain gages used in the test.

W-K-M Valves

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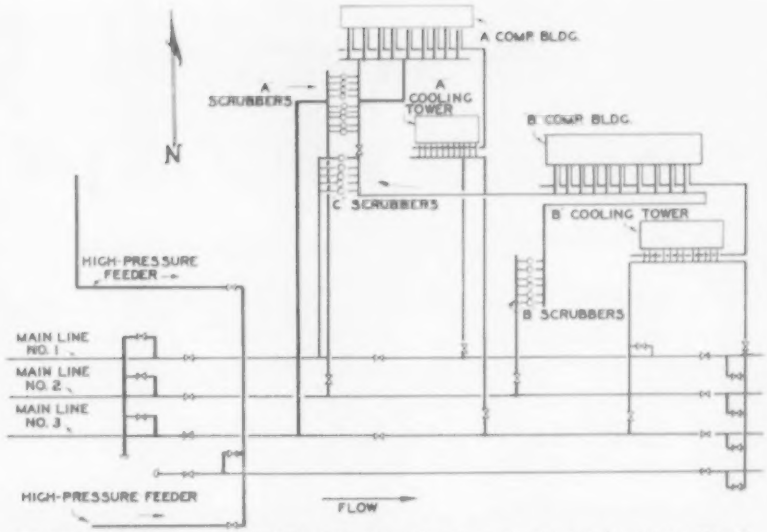

STATION 40 after yard piping had been changed as a result of detailed analysis. Fig. 5.

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and marked on the schematic at proper positions. (Permillage = parts per thousand, as percentage = parts per hundred.)

Then, **any** convenient assumption as to how the flow distributes of itself through the circuits is made, taking care that the total flow approaching a junction such as a tee, equals the total flow leaving the junction.

These initial assumptions are the "relative flows Q_1," and are placed on the work sheet, Table 2. A plus sign indicates flow in a clockwise direction, and a minus sign shows flow in a counterclockwise direction, **in that particular circuit.**

The relative resistance R_1 is found by entering Fig. 4 at the proper pipeline size, using the relative flow, Q_1. (Fig. 4 is a nomographic solution of Equation 10 with a temperature base of 60° F., a pressure base of 15.025 psia. and a specific gravity of 0.600.) The relative resistance is multiplied by the equivalent length to obtain ΔP_1, which has the same algebraic sign as the relative flow.

Each ΔP is then divided by its respective relative flow. The algebraic summation of the ΔP's in each circuit, and the summation of the $\Delta P/Q$, is obtained. The correction factor ΔP_1, for each circuit is obtained by the use of Equation 21 where n is 1.875, the empirical exponent of Q in Equation 10.

If one pipe leg is common to two or more circuits, that particular pipe must have all pertinent correction factors applied to it for the next successive calculation. (Notice that the ΔQ from one circuit changes sign in this case as it is applied to the common pipe leg in another circuit.)

Notice that the relative flow Q_2 is obtained by applying the correction increments, ΔP_1, to the relative flow, Q_1. The second calculation is performed in the same manner as the first, with the succeeding calculations being carried to any degree of precision desired.

To calculate the "pseudopressure loss" between any two points in the system, the ΔP's of each pipe leg on any flow path between the two points are added from the last adjusted computation. For example, the "pseudopressure loss" between "A" and "B" in Fig. 3, is the addition of ΔP_3 of pipe legs Nos. 1, 2, 3 or addition of legs Nos. 7, 6, 5, 4. This is 2.274 as against 2.351, and represents a calculation precision of 3 per cent, which will be considered sufficient for the problem.

Actual pressure drop . . . To find the actual pressure loss between these two points, the "pressure-loss coefficient" is computed, which is:

$$E\ (TZ_f/P)\ (\text{Total flow}/1{,}000)^{1.875} \times (G/0.600)^{0.875}$$

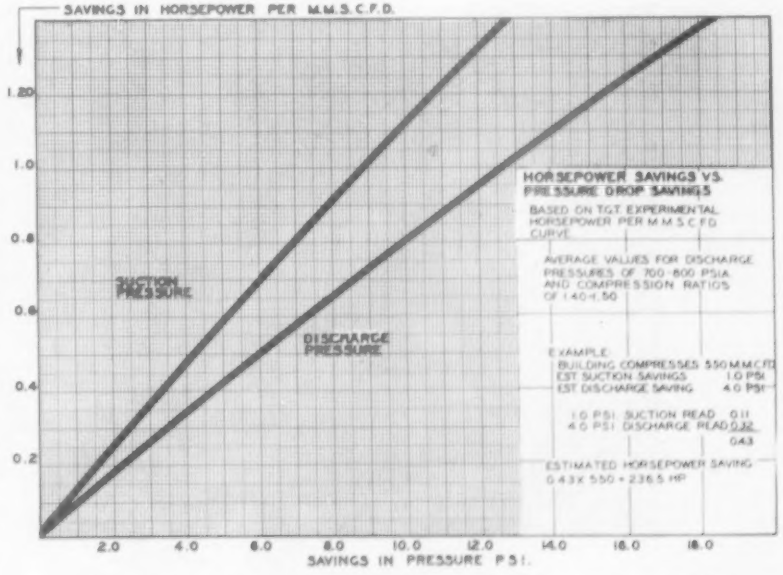
Table 3 is supplied for ease in this computation.

From the data on Fig. 3, using 1.15 for E, and using 0.60 for G, this is:

$$1.15\ \frac{530}{500 \times 1.076} \times (1{,}170/1{,}000)^{1.875} = 1.52$$

The actual pressure loss between "A" and "B" is then the "pseudopressure loss" times the "pressure-loss coefficient," or $1.52 \times 2.35 = 3.57$ psi. for these conditions of temperature, pressure, and total flow. If the permillage flows into and out of the network change **with respect to each other,** a

HEADER ARRANGEMENTS for parallel scrubber battery. Fig. 6.



VARIATION of horsepower savings with elimination of pressure drop. Fig. 7.

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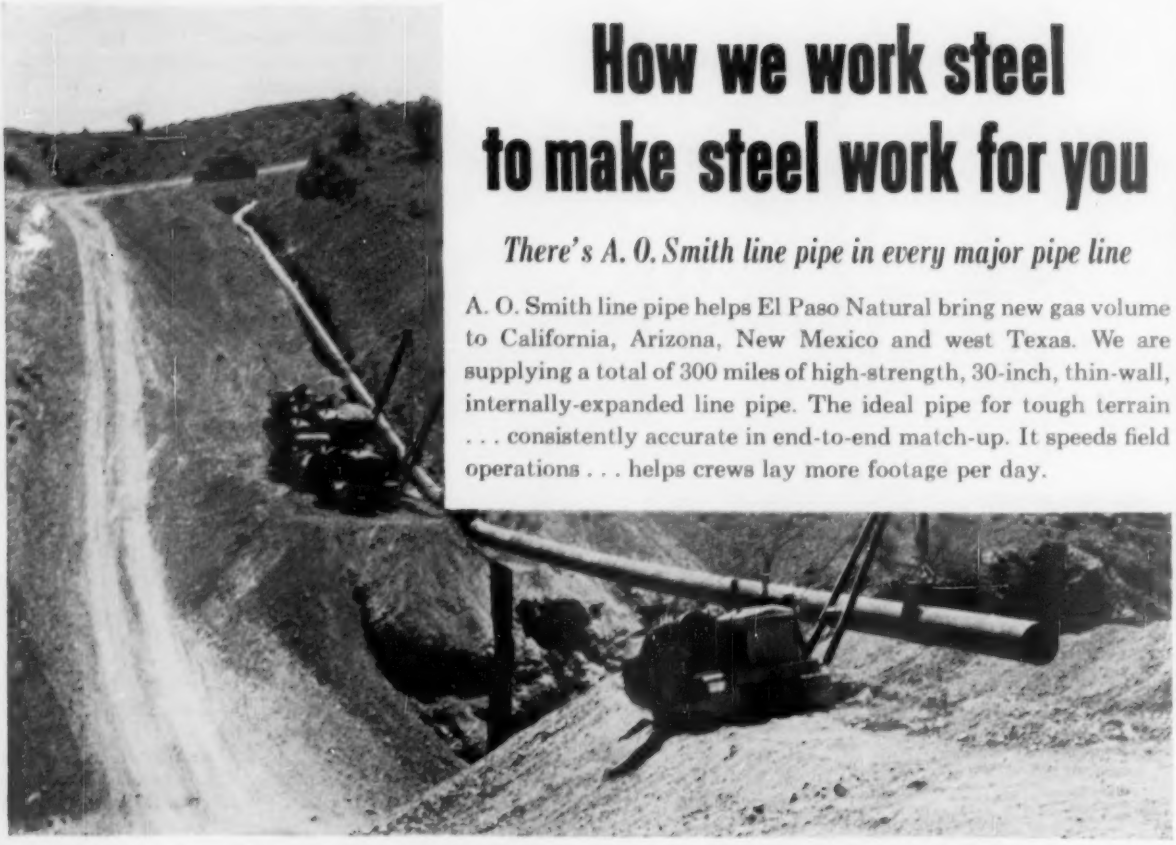

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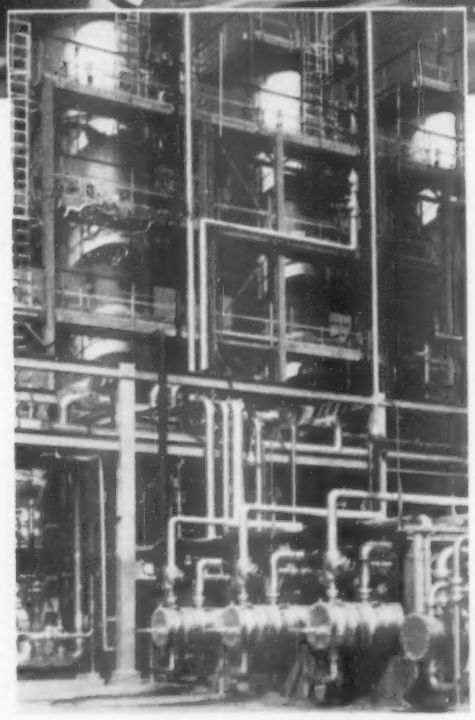

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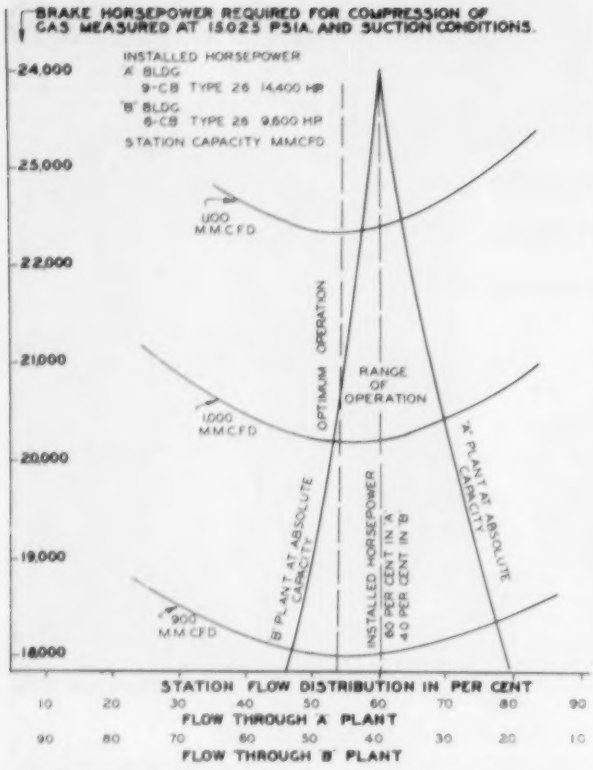
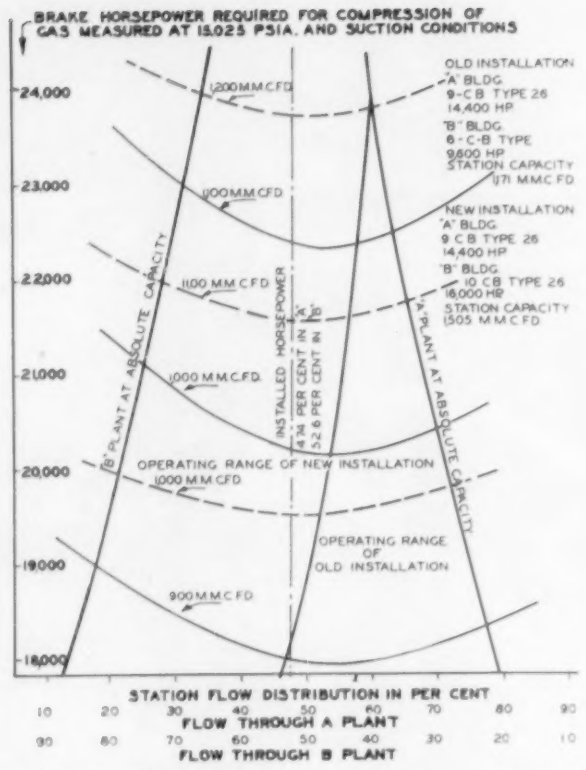


YARD-PIPING PERFORMANCE curves of Station 40 with old piping system. Fig. 8.


BRAKE HORSEPOWER REQUIRED FOR COMPRESSION OF GAS MEASURED AT 15.025 PSIA AND SUCTION CONDITIONS
OLD INSTALLATION
'A' BLDG. 9-C.B. TYPE 26 14,400 HP
'B' BLDG. 6-C-B TYPE 9,600 HP
STATION CAPACITY 171 M.M.C.F.D.
NEW INSTALLATION
'A' BLDG. 9 C.B. TYPE 26 14,400 HP
'B' BLDG. 10 C.B. TYPE 26 16,000 HP
STATION CAPACITY 1505 M.M.C.F.D.
24,000
23,000
22,000
21,000
20,000
19,000
18,000
1200 M.M.C.F.D.
1100 M.M.C.F.D.
1000 M.M.C.F.D.
900 M.M.C.F.D.
'B' PLANT AT ABSOLUTE CAPACITY
'A' PLANT AT ABSOLUTE CAPACITY
INSTALLED HORSEPOWER 47.4 PER CENT IN 'A' 52.6 PER CENT IN 'B'
OPERATING RANGE OF NEW INSTALLATION
1000 M.M.C.F.D.
OPERATING RANGE OF OLD INSTALLATION
STATION FLOW DISTRIBUTION IN PER CENT
10 20 30 40 50 60 70 80 90
FLOW THROUGH 'A' PLANT
90 80 70 60 50 40 30 20 10
FLOW THROUGH 'B' PLANT

COMPARISON of old and new yard piping systems at Station 40. Fig. 9.

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TABLE 3—NUMBERS RAISED TO POWERS FOR USE IN SAMPLE PROBLEM

N	$N^{1.875}$	G	$\left(\frac{G}{0.600}\right)^{0.575}$
0.65	0.446	0.550	0.927
0.70	0.512	0.560	0.942
0.75	0.583	0.570	0.956
0.80	0.658	0.580	0.971
0.85	0.737	0.590	0.985
0.90	0.821	0.600	1.000
0.95	0.907	0.610	1.015
1.00	1.000	0.620	1.029
1.05	1.093	0.630	1.044
1.10	1.196	0.640	1.058
1.15	1.300	0.650	1.072
1.20	1.408	0.660	1.087
1.25	1.520	0.670	1.101
1.30	1.635	0.680	1.115
1.35	1.755	0.690	1.130
1.40	1.879	0.700	1.144
1.45	2.007	0.710	1.159
1.50	2.139	0.720	1.173
1.55	2.274	0.730	1.187
1.60	2.414	0.740	1.201

whole new set of calculations must be made using the new figures. If permillages remain constant, but throughput, temperature, and pressure vary, the network is easily solved by the simple expedient of computing a new pressure-loss coefficient.

In looking over the ΔP_3's in Table 2, it is noted that the greatest pressure loss occurs in pipe leg No. 5. Would it be more economical to spend more money for larger pipe in this leg, thereby by reducing pressure loss and the resultant horsepower requirements? Would it be more economical to install a third line parallel to pipe legs Nos. 1 and 5?

To answer these questions, other sets of calculations using other piping arrangements should be made and compared with each other.

Limitations . . . The "E" factor of Equation 10 is determined by experience. It is more or less a function of the ratio of "friction factor" values as determined by Equation 7 and by actual test.

The author has found this "E" factor to be reproducible in the neighbor-

TABLE 4—COMPARISON OF MEASURED AND CALCULATED PRESSURE LOSSES AT STATION 40

	Press. losses—Measured	Press. losses—Calculated	
From station suction header to "A" building header	7.9	7.87	Old piping system—Fig. 1 arrangement. Station throughput, 1,153 M.M.c.f.d. Flow distribution, 61.5 per cent through "A," 38.5 per cent through "B."
From station suction header to "B" building header	6.7	6.60	
From "A" building header to station discharge header	10.3	10.00	
From "B" building header to station discharge header	5.9	6.75	
From station suction header to "A" building header	5.4	5.05	New piping system, Fig. 8 arrangement. Station throughput, 1,192 M.M.c.f.d. Flow distribution, 60 per cent through "A," 40 per cent through "B."
From station suction header to "B" building header	3.7	3.80	
From "A" building header to station discharge header	7.3	6.80	
From "B" building header to station discharge header	2.6	2.75	

Calculated scrubber loading ratios (in terms of "B" battery

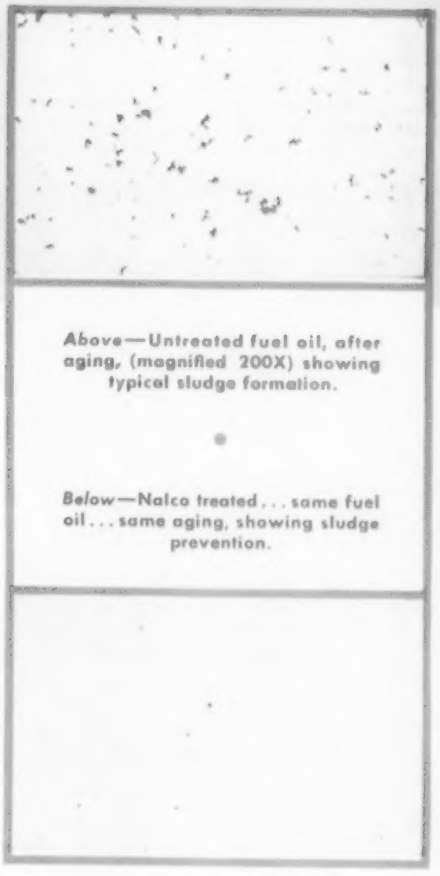
Relative flow		
	Per cent	Ratio of differentials
A	5.1	$(5.1/4.2)^{1.875} = 1.44$
B	4.2	$(4.2/4.2)^{1.875} = 1$
C	5.7	$(5.7/4.2)^{1.875} = 1.77$

Measured scrubber loading ratios

Measured, inches of water		
		Ratio of differentials
A	22	$22/16.5 = 1.33$
B	16.5	$16.5/16.5 = 1$
C	30	$30/16.5 = 1.82$

STABILIZE
DISTILLATE FUEL OILS

with *Nalco* Fuel Oil Treatments



Above—Untreated fuel oil, after aging, (magnified 200X) showing typical sludge formation.

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hood of 1.00 to 1.06 for main-line piping outside the station yard, and in the neighborhood of 1.15-1.20 for station-yard piping. It is felt that the difference is largely due to the fact that Tennessee's main lines are cleaned by "pigging" when constructed, while station-yard piping, due to the number of ells, tees, valves, and other fittings, are cleaned by hand or chemically. Another more important factor contributing to the difference in "experience factors" is that distillate is found in the suction system of the station, and other oils, probably scrubber oil and compressor lubricating oil, are found in the discharge system.

Any network, no matter how intricate, may be solved by this method of calculation, but due to the peculiarities of compressible flow, should not be used in a network where the factor TZ_f/P changes more than 6 per cent between inlet and outlet. This point, however, is largely a matter of the degree of accuracy desired in determining the flow through each individual pipe leg.

Dead-weight gages were used in the measurement of pressures, and the pressure losses were determined by subtraction of the smaller pressure from the larger. This method is subject to several limitations as to its accuracy. A pressure measurement by dead-weight gage, in itself is probably correct to within a few hundredths per cent, plus or minus. But this error is expanded to a very large degree when two pressures are read and subtracted to find the pressure difference between two points. The smaller the pressure loss, the greater the relative percentage of possible error.

In order to keep the possible error at a minimum, all dead weights were calibrated against a standard, all were kept clean and well maintained, and were operated with extreme care by experienced personnel.

Equivalent lengths of fittings are a moot point. They are empirical values determined by test. But to be strictly correct values, the interior roughness of the fitting should be exactly the same as that of the pipe with which it is used. Since the fittings comprise such a large part of the total lengths, it will be up to the engineer to decide whether the experimental values hold for his particular conditions.

The calculations, of course, cannot compensate for valves left partially closed by accident, or for unequal resistances caused by more liquid being in one line than in another, or for additional pressure losses caused by eccentricity in flanged connections.

Results of Analysis as Applied to T.G.T.'s Station 40

Fig. 5 is a schematic diagram of the station-yard piping network after the 1954 construction. It represents the changes decided upon as being best from the standpoints of present economy and plans for future expansion. Note that this is a much more intricate network than that which existed prior to the construction program (shown in Fig. 1).

Table 4 is a listing of calculated and measured pressure losses through the yard of each of these two piping systems.

It will be noted that in the system of Fig. 5 there are three batteries of scrubbers. These are connected on their outlets by a common pipeline, thereby utilizing all scrubbers at all conditions of loading. For example, in Fig. 1, if "B" building was not operating due to repairs, low throughput or some such reason, the "B" scrubber battery would not be "paying its way." It could not be in use at all during this load condition, due to the piping arrangement. If the building were only partially down, the scrubber battery would not be operating as efficiently as the other battery, which would be in full use.

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Analysis predicts loading . . . However, a condition of unequal scrubber loading was predicted for the design shown in Fig. 5. The analysis showed a relative flow of 51 through the southernmost scrubber of "A" battery, 42 through the southernmost scrubber of "B" battery, and 57 through the southernmost scrubber of "C" battery, at normal operating conditions.

Since the predicted condition was not severe, it was decided to install the design as shown, and check predicted pressure loss ratios with measured values. This would show just how accurate the computation method and its pressure loss formula was, and exactly to what extent it could be depended upon. The results of this facet of the design speaks for itself in Table 4.

It has been calculated that this condition of unequal loading would be remedied, and **40 additional horsepower saved,** by removing one scrubber from "B" battery and placing it in "C" battery.

The cooling tower is another place where subtle changes in piping mean horsepower savings. "A" cooling tower is less efficient than "B" tower because of the inlet and outlet header arrangements. This is an observation made by calculation, which could not be proved at this station because of the lack of places to read a differential across each cooling coil. Observations have been made on similar piping at other stations, however, and have proved the trend of flow distribution as calculated.

Fig. 6 illustrates the general cases of header arrangements serving a battery of coils, scrubbers, meters, etc., which are connected in parallel. By calculation, it may be determined which is more economical. For example, at extremely low flow (a) would be more economical than (c) since it takes less pipe and fittings. And conversely, at a high flow, (c) would be more economical even though construction costs would be higher. The more units in the battery, the wider the flow distribution through the units.

Horsepower calculations were made by the use of Fig. 7, a chart developed to convert pressure savings directly into horsepower savings. Horsepower saved at this station was 762 as calculated by the measured pressure savings, using the charts. Construction costs attributed to these changes was $124,680, or $163.62 per horsepower. This is just over half the per horsepower cost of installing an engine!

And, at the rate of $12 per horsepower-year operating costs (which includes fuel gas, lube oil, and parts maintenance), this investment in "remodeling" yields a return of 7.3 per cent!

Piping changes in the yards of three compressor stations during 1954 total a saving of 2,319 hp., at a total construction cost of about $363,000, and calculated values in all cases have had a reasonable degree of accuracy.

In the opinion of the author, however, the most conclusive proof of the calculations are the results of the measured differentials across the scrubber batteries. These differentials were measured with a high-pressure manometer, to eliminate the inherent errors of the dead-weight gages.

It has been proved that the calculations will predict performance of a design. To carry it further, then, we may calculate an optimum operating condition. Fig. 8[3] shows a plot of horsepower requirements versus flow distribution at various throughputs, corresponding to the piping arrangement shown in Fig. 1. The low points of the curves fall on the flow distribution of about 53 per cent through "A" and 47 per cent through "B."

For instance, at a throughput of 1,000 M.M.c.f.d., it costs about 250 hp. to operate "A" at full capacity, rather than operating "B" at full ca-

In service 19 months, the Deming Vertical Sump Pump shown above takes suction from a sump into which flows crude oil, varying amounts of water, dirt and sand removed from a collecting network of gas pipe lines. The pump operates automatically by float control in accordance with the level of fluids in the sump from which it delivers to an oil storage tank. Performance of the Deming Pump is reported as *"satisfactory for the purpose intended."* For dependable pumping service "SPECIFY DEMING PUMPS."

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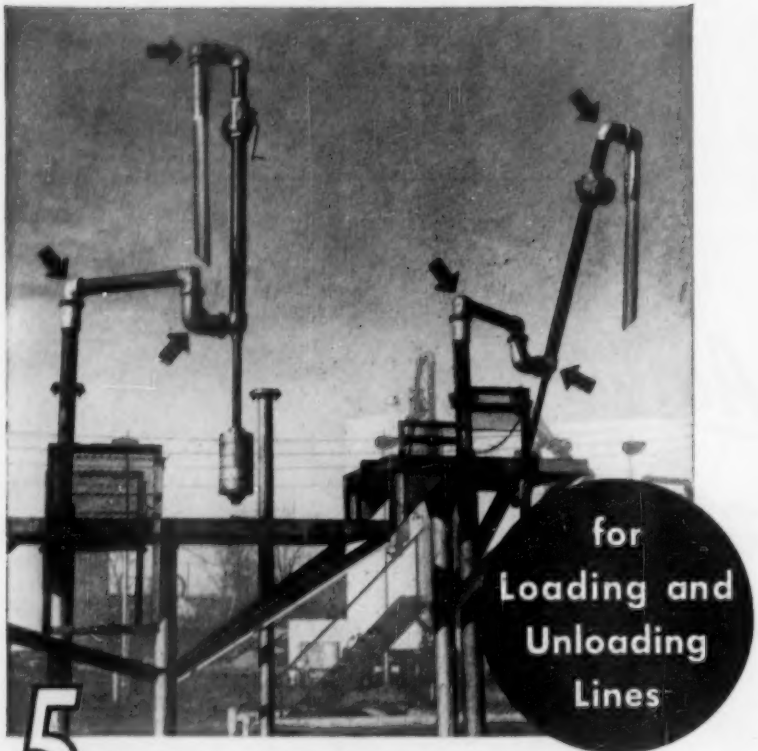

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pacity. And at absolute station capacity, about 100 hp. is wasted, because the percentage horsepower distribution does not fall on the low point of the curve, which is the optimum operating condition.

This station was fairly well designed in this respect, but at one of our stations, about 650 hp. was wasted in this manner!

Fig. 9[3] graphically illustrates the performance of the old and new piping systems. Note that the new system's curves are flatter, giving a much larger variation of possible flow distribution at an economical level of operating costs.

The point of design, then, is to make the low point of the throughput curves fall at that point of percentage flow distribution which equals the percentage horsepower distribution.

And the point of economical operation is to operate as close as possible to the low point of the curves at all times.

The described method may be used to advantage in compressor station yards, hydrocarbon recovery plants, gathering line networks, and other such piping arrangements.

By using the calculations, it is possible to:

1. Determine the flow at any point in the system.
2. Determine the pressure loss between any two points.
3. Determine over-all operating efficiency under any conditions of temperature, pressure, or load, and consequently the costs of operating at those conditions.
4. Accurately predict the performance of any proposed design, and consequently, select the most economical design.
5. Uncover any subtle "parasitic" pressure losses.

To make the calculations, the engineer needs:

1. A good inventory of sizes of pipe, pipe lengths, types of fittings, etc., of the network to be calculated.
2. A reasonably good idea of the magnitude of flows, at each entrance to the network, and at the network exits.
3. A good idea of operating pressures and temperature.

Calculations are made simply and quickly, and the analyst has the values in perfect order for inspection.

References

1. "Flow of Fluids in Closed Circuits," R. J. S. Pigott, Mechanical Engineering, August 1933.
2. Piping Engineering Paper 3.01, Tube Turns, Inc.
3. These two charts presented before the Oil and Gas Production Division, A.S.M.E., June 1954, by O. H. Moore, Tennessee Gas Transmission Co., in a paper entitled "Do You Need More Horsepower" and published by Pipeline News, July 1954

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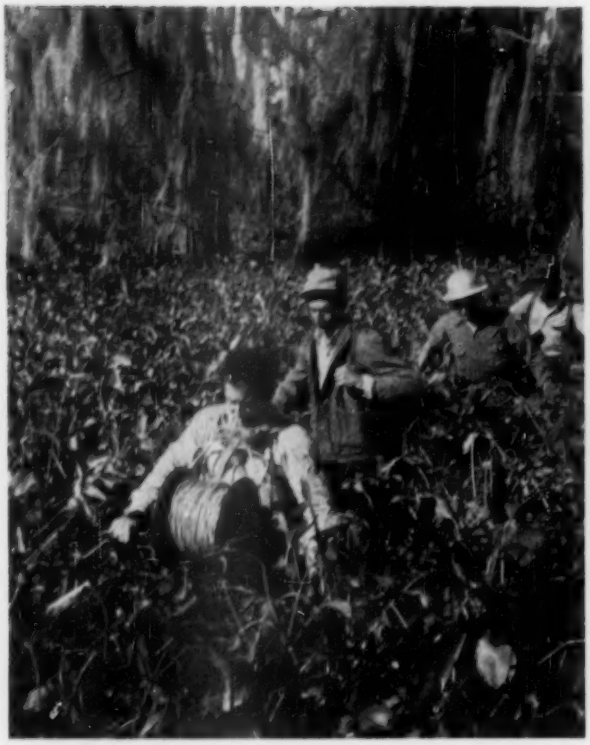


GEOPHYSICAL WORK in South Louisiana is performed under adverse conditions in the swamp country. Sometimes it is necessary to pack the equipment to the prospect.

ACCESS ROADS can be a major expense item on a wildcat location. Here it was necessary to build a plank road to get to the well site.

South Louisiana's Inviting—But Expensive

Its rich Miocene trend is luring large independents into its swampy depths

by Norman S. Morrisey
Drilling-Development Editor

CAN independents break into South Louisiana? Yes, for some 115 new operators have entered the area during the past 24 months and the number is increasing.

The majority of them are "dry land" operators and concentrate on the Oligocene and Wilcox trends. Here most of the pay zones occur above 10,000 ft., there is slightly less danger of blowouts, and operating expenses are low compared to bayou and swamp operations on the Miocene trend.

But the independents look longingly toward the rich Miocene trend where ultimate recoveries are high and the reserves are larger. (Table 1).

Several large independents have made a go of it in the deep expensive Miocene country and more want to try. Richardson & Bass, John Mecom, and William Helis have built up sizable Miocene reserves in recent years. "If they can do it, why can't I," seems to be the attitude of some of the independents.

Undoubtedly many of them can and will succeed. But South Louisiana is no place for a "poor boy" outfit. Wells are expensive, with a 14,000-ft. wildcat costing in the neighborhood of $400,000. If a blowout occurs, the cost is doubled or tripled. Barge drilling will run $3,000 per day. Access canals will cost from $20,000 to $100,000, and in isolated instances even more.

Major companies moving over . . . South Louisiana has long been a major-company preserve. The Texas Co., Shell Oil Co., Humble Oil & Refining Co., The California Co., and Gulf Oil Corp. among others have built up a backlog of valuable experience and information as well as reserves. They know the regional and local geology, the drilling problems, transportation headaches, and have the scientific know-how and experienced personnel to cope with most of the problems and obstacles.

Admittedly, they can operate more cheaply in the area than a rank newcomer. But this should not deter an aggressive company. New ideas and a fresh outlook will find more oil whether the area is South Louisiana or Saudi Arabia.

Farmouts . . . Possibilities for farmouts in South Louisiana are increasing. Major companies are concentrating on offshore operations. At the present time there are over 48 active offshore locations; by January 1, 1956, there may be over 100 rigs turning to the right offshore.

Major companies have little choice. They must process the offshore state lease blocks within 12 months of leasing or face rental payments equal to one-half the original bonus payments.

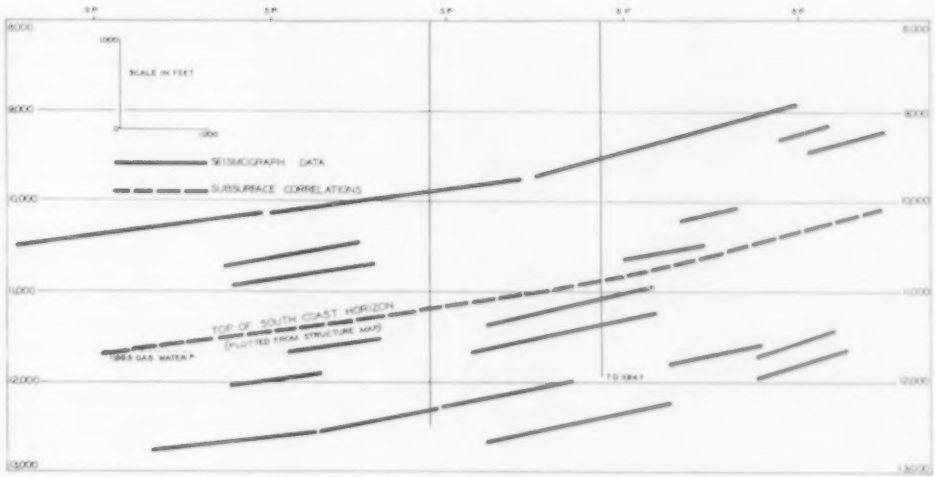
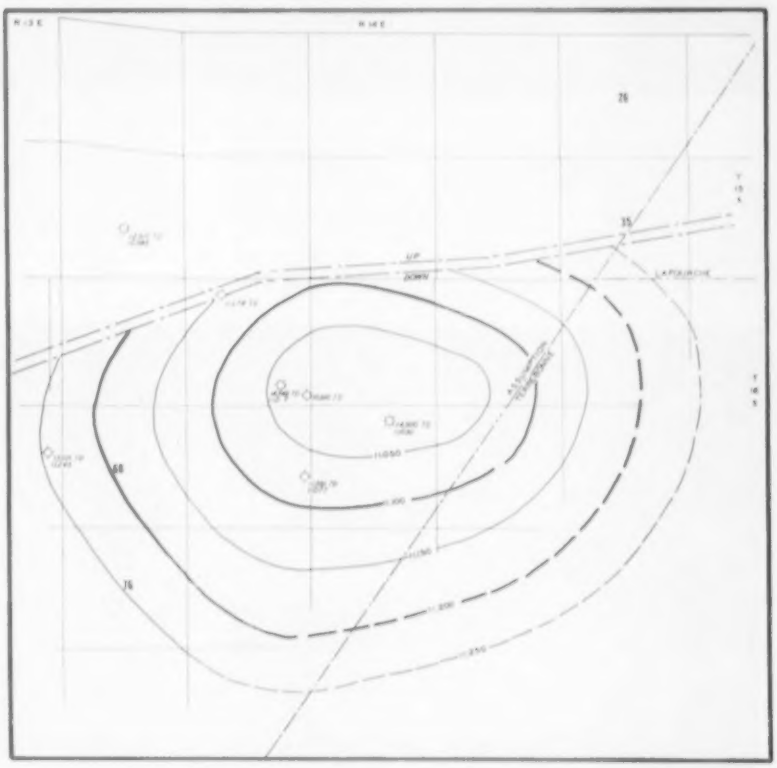


Fig. 1 — (Left) Subsurface and seismic data are tied together to determine the oil possibilities of a structure. Some companies use seismic work for spotting development wells.

Fig. 2 — (Below) Detailed subsurface and seismic work led to the discovery of a rich gas-condensate reserve at Amelia. Note that two dry holes on crest of structure were too shallow to test pay sands found below 14,000 ft.



This is a strong incentive to drill. Some of the 5,000-acre tracts went at bonuses of over $1,000 per acre. The rental payment on such tracts will be nearly 3 million dollars. A deep test including platform costs about 1½ million dollars and will serve to evaluate the block. If it hits, the company has found an oil field and in addition saved the lease rental payment.

Few companies, however, can carry the offshore burden without reducing their budgets in other areas. Offshore drilling costs may run as high as $5,000 to $10,000 per day. By January 1, 1956, these operations will run from half a million to a million dollars a day.

Some observers believe that the major companies may be forced to cut down on their land drilling to carry this financial load; thus farmouts, the independent's "bread and butter," could become numerous.

Miocene Trend

On land, about 100 seismic crews are active in South Louisiana. They are trying to locate sizable structures and in an area that has been combed over for the past 25 years.

Surprisingly enough they are finding them! Already in 1955 there have been 69 successful exploratory tests* with only 70 dry holes, giving oil companies a phenominal exploratory success record of nearly 50 per cent. The companies are not down to the "microstructure" phase of seismic work. In South Louisiana a drilling block means 2,000 to 3,000 acres and the successful rank wildcat will uncover substantial reserves, even today.

Leasing . . . Land on the Miocene trend is expensive. Nearly 70 per cent of the acreage is held by the state or by large landowners like Louisiana Land & Exploration Co.

*Exploratory tests include new field wildcats, new pool wildcats, stepouts, etc.

State-owned land is leased by competitive sealed bids; and more often than not several companies have had geophysical options on the land. This makes for steep bidding and top bids of $1,000 per acre have been made on choice tracts.

Privately owned land also commands a premium if favorably located. Many of the large landowners lease their land for a 12-month geophysical option at $10-$15 per acre. If the oil company decides to lease, bonus prices range from $10 to $25 per acre.

Offshore leasing has created a problem because of the large bonus payments. Land owners are asking why there is the price difference between land and offshore leases. The situation, however, differs in the two areas. On land, companies may lease **before** processing the block with the seismograph; offshore, the seismic work has been done. In addition, the land area has been thoroughly worked over and the big structures for the most part have been found—the return on the original investment is low compared to offshore structures. Offshore, companies are skimming the cream on a

TABLE I—AVERAGE CORE-ANALYSIS DATA FROM PRINCIPAL PRODUCING ZONES

FORMATION	FORMATION CHARACTERISTICS	PHYSICAL CHARACTERISTICS			FLUID SATURATIONS		
		Perm.	Porosity	Wet Density	Oil (% Pore)	Water (% Pore)	Connate Water
MIOCENE	COARSE GRAIN SAND	2,000 – 10,000	28 – 32	1.95 – 2.05	15 – 30	30 – 45	15 – 30
FRIO	IRREGULAR GRAIN SIZE, SILTY, BENTONITIC SAND	1,000 – 8,000	30 – 35	1.98 – 2.05	10 – 25	35 – 45	15 – 35
YEGUA-COCKFIELD	IRREGULAR GRAIN SIZE, FINE GRAIN, SILTY SAND	500 – 5,000	32 – 37	2.00 – 2.15	8 – 15	45 – 65	25 – 45
WILCOX	HARD, FINE GRAIN, MICACEOUS SAND	25 – 500	18 – 24	2.12 – 2.30	4 – 12	30 – 50	25 – 45

Data courtesy Core Laboratories, Inc.

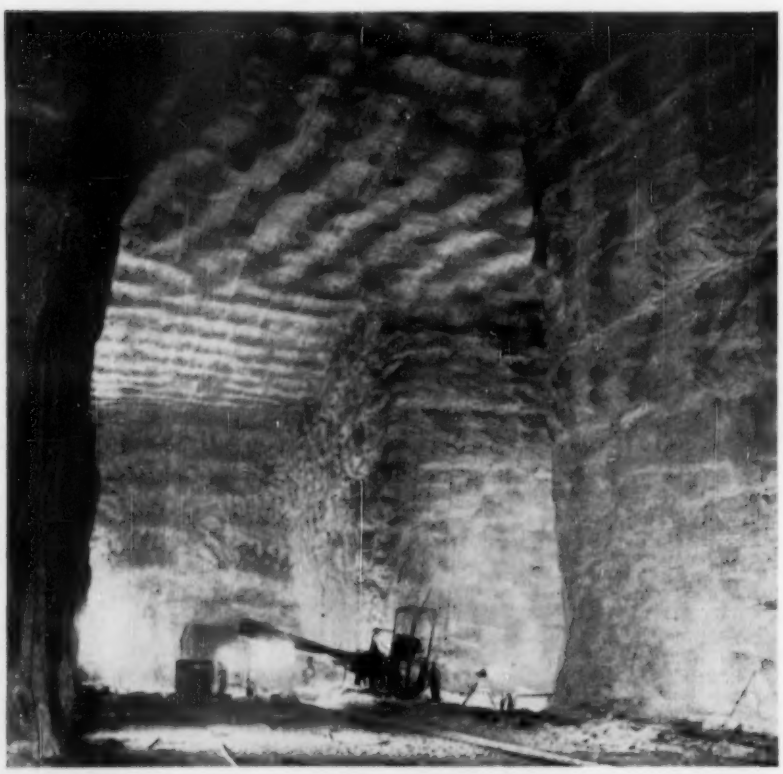
known and rich Miocene trend. They are looking at a "South Louisiana" of 30 years ago but have the advantage of their past experience in interpreting seismic results plus all the latest advances in exploratory work.

Interpretation . . . In land exploration work in South Louisiana interpretation is all important. Oil companies have been shooting in the area for the past 30 years, and the area has been subjected to a concentrated effort throughout the entire history of both gravity and seismic methods of exploration. But the competitive effort that the United States economy enjoys has produced many new oil fields. One interpretation is not considered the final answer; oil companies go back in and reshoot the areas using new methods.

All phases of exploration are important. No one method is the dominating factor. Geology and stratigraphy are carefully interwoven with the gravity and seismic data. The results are new oil fields and exploration efforts in South Louisiana continue to expand.

Costs . . . It is expensive to look for oil in South Louisiana's Miocene trend. The average 10,000-ft. wildcat costs about $125,000. This does not include the cost of roads or access canals, nor completion costs such as casing, tank batteries, and the like. The tendency today in South Louisiana is toward deeper reserves and higher costs. M. L. Mayfield's recent 14,500-ft. discovery well at Amelia, for example, cost about $500,000.

Seismic operations run from $20,000 per month to keep a crew in the field to over $50,000. At the same time, production is very erratic; in tough going, crews may only shoot one or two profiles a day.



ON THE MIOCENE TREND most of the producing fields are related to salt movement. Hence, gravity work has played an important role in South Louisiana exploration because the gravimeter can map the density contrast between the salt and the surrounding denser sediments. Here's a view of salt mining at Weeks Island salt dome.

Setting up in South Louisiana . . . In the past, oil companies have entered South Louisiana, drilled one or two dry holes, and pulled out. Now the attitude is changing. Companies realize they need a backlog of information before they can expect to hit. They are setting up geological staffs, acquiring necessary subsurface maps, and carefully evaluating prospects before drilling. It's an expensive process, but the results pay off.

Future reserves . . . The possibilities of finding new oil are good in South Louisiana. Advanced seismic techniques are uncovering new structures, making the exploration and drilling outlook bright for the next 5 years. The flanks of the known domes will continue to give up oil for many years to come.

Recoveries of 800 bbl. per acre-foot are an attractive target for the bit. Thus far most of South Louisiana's production has been controlled by structural conditions. Experts consider that half of an oil province's production may come from stratigraphic traps. South Louisiana's present reserves are about 2.4 billion barrels, nearly all on known structures. Thus stratigraphic traps may yield another 2.4 billion barrels of oil.

The problem is to find this type of trap.

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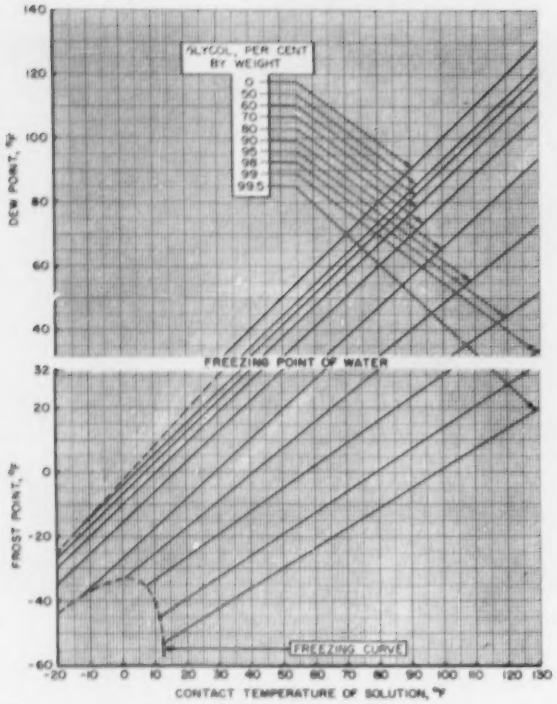
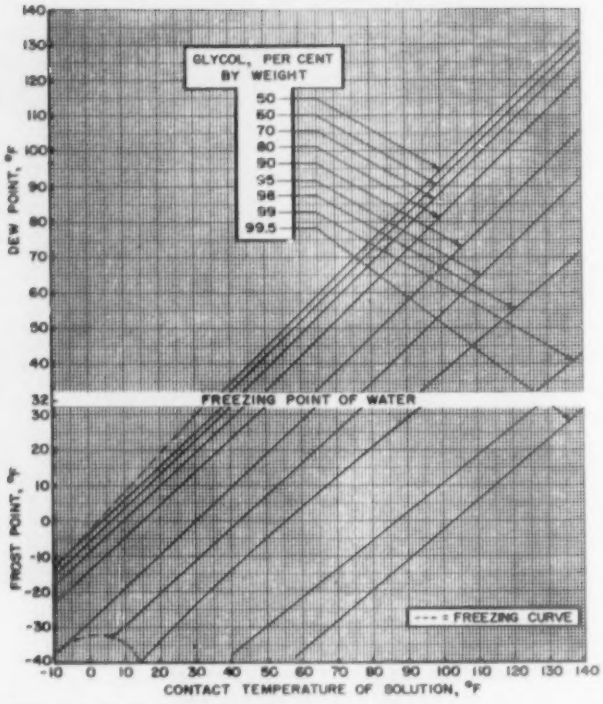


DIETHYLENE GLYCOL—dew points of aqueous solutions at various contact temperatures. Fig. 1.



TRIETHYLENE GLYCOL—effect of aqueous solutions on dew points at various contact temperatures. Fig. 2.

Equilibrium Dew Points in Natural Gas-Glycol Systems

by L. D. Polderman

THE glycols are noted for their hygroscopicity which is one of the characteristics that have led to their widespread industrial use. Diethylene glycol has been successfully used to dehydrate natural gas for approximately 20 years. While triethylene glycol has been used to dehumidify air since 1939, it has been used for dehydrating natural gas only for the past 5 years. Both of these glycols have high boiling points, are relatively thermally stable, and do not significantly degrade in normal plant usage.

The dew-point depression obtained with a glycol dehydration plant depends upon several factors, such as:

1. Concentration of water in the lean glycol solution.
2. Glycol circulation rate.
3. Contact temperature in the top of the absorber column.
4. Efficiency of gas to glycol contact in the absorber.

Even with conservative design and operation, however, the dew point of the gas leaving the glycol contactor cannot be lower than the equilibrium value for the conditions of temperature and glycol concentration found on the top plate.

High concentrations . . . In view of the high diethylene and triethylene glycol concentrations now being secured in plant practice, laboratory studies were initiated to determine the dew points of gas in equilibrium with such solutions. These data as well as a chart showing a comparison of the hygroscopicity of diethylene and triethylene glycol are shown in Figs. 1, 2, and 3.

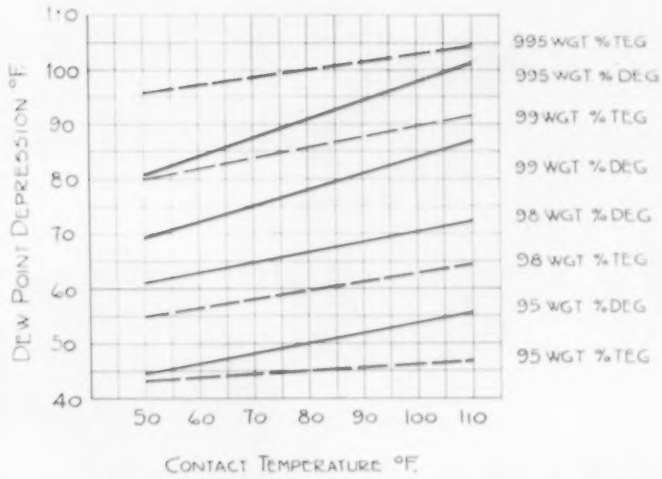
As far as we have been able to determine in laboratory tests, pressures in the range of 2,000 psi. do not significantly affect the curves. It should be mentioned, however, that there is some plant experience indicating that the higher dew-point depressions may not be obtainable at low contact temperatures such as 50° F. or below. This is not only because of the reduction in hygroscopicity with contact temperature as shown on the charts, but also possibly because of an adverse effect of the increase in viscosity of the glycol solution or other factors affecting plant performance.

Operating results . . . It may be of interest to compare briefly plant operating experience with the dew point curves and the boiling point curves shown in Figs. 4 and 5. For many years, a dew-point depression of 40°-50° F. was considered the maximum obtainable with diethylene glycol in a conventional plant regenerating the rich solution at atmospheric pressure and a temperature of 290°-320° F.

More recently, some diethylene glycol plants handling sweet and oxygen free gas have been securing 65° F. depressions by increasing the regeneration temperature to 350° F., thus obtaining a lean solution with 2-3 per cent water rather than 4-6 per cent as provided in earlier practice. The curves indicate that with a 97-98 per cent diethylene glycol solution, dew-point depressions in the 60°-65° F. range may be expected.

Diethylene glycol plants in which the solution is concentrated under vacuum [1,2,3] have now been in operation for several years and have consistently provided dew-point depressions of 80°-

Author is with Carbide & Carbon Chemicals Co. Paper presented at the Gas Conditioning Conference, University of Oklahoma, Norman, 1955.



COMPARISON OF hygroscopicity of diethylene and triethylene glycol. **Fig. 3.**

Engineering at Midyear

100° F. Concentration of the rich solution is accomplished at vacuums of 18-24 in. of Hg (3-6 psia.) and temperatures in the range of 250°-300° F. The vacuum may be secured by a steam jet exhauster or a vacuum pump operating on a tank collecting the condensed overhead from the regeneration still.

Analysis of lean solutions from such plants has shown water contents from 2 per cent to as low as a few tenths per cent. Concentrating the solution under vacuum allows the production of an extremely low-water-content fluid without the use of abusively high temperatures. The data show equilibrium dew-point depressions in the range of 70°-100° F. for 99 and 99.5 per cent diethylene glycol solutions.

Triethylene glycol . . . In the past 5 years triethylene glycol has become widely used as a liquid desiccant for natural gas, particularly in "packaged" wellhead units.[4,5] Regeneration temperatures of 350°-375° F. are standard practice in such equipment thus providing lean solutions containing 1.5-2.0 per cent water and depressions in the 60°-75° range.

Introducing natural gas into the reboiler of either a diethylene or triethylene glycol plant will reduce the water content of the lean solution below that shown on the boiling-point curves and thus further increase the theoretically obtainable dew-point depression.

Summary

Dew-point depressions of 65°-105° F. have been reported in glycol dehydration plants in recent years. The range of laboratory dew-point equilibrium curves has been expanded to include concentrations of 98 to 99.5 per cent by weight. These data indicate that both diethylene and triethylene glycol at 99.5 per cent concentrations are capable of providing dew-point depressions in the 75°-105° F. range.

At concentrations of 98 per cent and lower, diethylene glycol provides better depressions than equal concentrations of triethylene glycol, while at 99 and 99.5 per cent concentrations, triethylene glycol appears to allow a 5°-10° F. lower dew point than diethylene glycol.

References

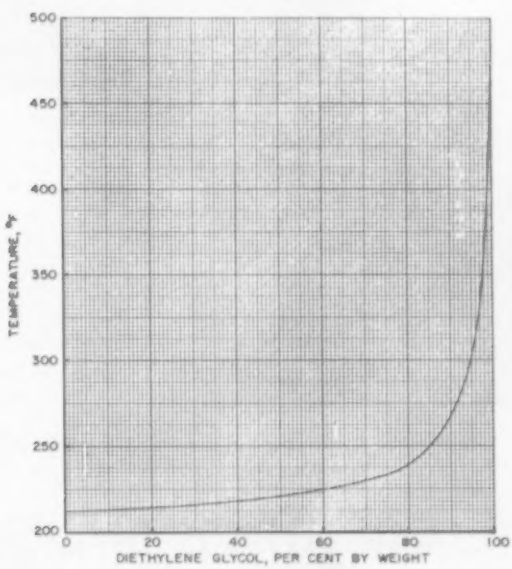
1. Four-Horizon Dollarhide's Casing-Head Gas Processed in New Gasoline Plant; J. R. McChesney, The Oil and Gas Journal, p. 123, Feb. 11, 1952.

2. Plymouth's Operations at Bessedum; Roy F. Carlson, The Oil and Gas Journal, p. 64, Nov. 23, 1950.

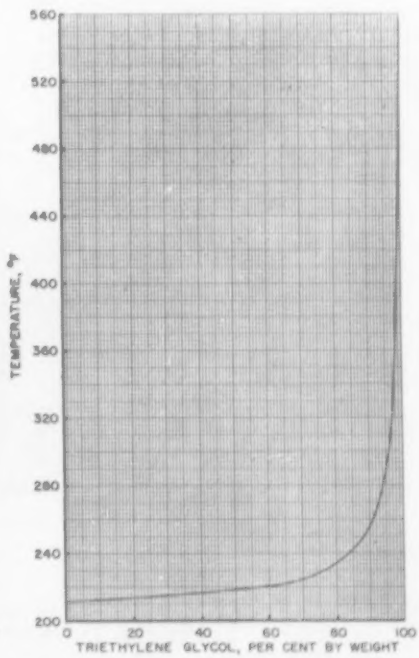
3. Slaughter Gasoline Plant; J. S. Bellah, R. V. Mertz, and J. W. Kilmer, The Oil and Gas Journal, p. 68, May 26, 1949.

4. Dehydration of Natural Gas and Hydrocarbon Liquids; J. M. Campbell and L. L. Lawrence, Petroleum Refiner, p. 109-116, Nov. 1952.

5. Natural-Gas Dehydration; L. L. Lawrence, The Oil and Gas Journal, p. 76, Jan. 7, 1952.



BOILING POINT as a function of composition for diethylene glycol-water solutions at 760 mm. pressure. **Fig. 4.**



BOILING POINT as a function of composition for triethylene glycol-water solutions at 760 mm. pressure. **Fig. 5.**

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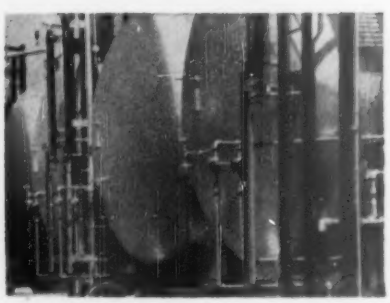

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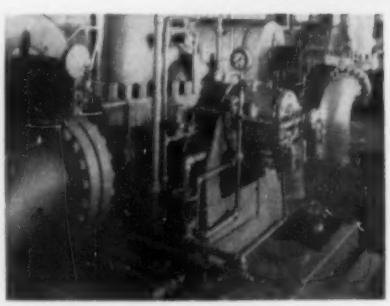

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Heavy-Oil Production Problems Are Tough in California

by J. J. McCullough

"Problems of heavy-oil production always seem to stem from . . . the physical problems caused by the high viscosity of the oil, and the economic problem of competition with more cheaply produced light oil which brings a higher market price."

PRODUCTION of very heavy oils of less than 12° A.P.I. gravity in California is unusually difficult because of their high viscosity and high density. However, the real problem of heavy-oil production is whether the oil will bring enough to the producer to pay costs.

Operating methods developed for these oils show that many of the physical problems can be solved by modern equipment and know-how. But satisfactory returns from investments in the production facilities are limited because of high operating costs and low market value of the oil.

This article describes the characteristics of the heavy oils produced and tells how some of the production problems are being handled.

Produced Fluid Characteristics

California heavy oils are of naphthenic base, contain large portion of asphaltic constituents, and are black in color. In analysis they range from 0 to 10 per cent gasoline; 10 to 20 per cent gas oil, and 70 to 90 per cent residium. Usually the heavy crudes are high in sulfur, 4 to 8 per cent. However, San Ardo crude contains only 2.3 per cent sulfur.

In gravity the crudes range upward from about 6° to 12° A.P.I. The simple gravity determination is difficult to make and is subject to many errors because of impurities of water, sand, and silt. The most reliable method of obtaining gravity of very heavy oil involves blending of the original oil with a known volume of light oil of known gravity and calculating the gravity of the original oil from the gravity of the mixture.

Viscosity . . . Heavy oils have very high viscosity. It has been calculated that using the standard Saybolt Universal viscosimeter at 100° F., the time to run 60 cc. of one particular 6.9° crude through the instrument would take 80 days. With a Furol tip the same measurement could be made in 8 days. By heating the oil sufficiently this time can be reduced, but error is introduced by the evaporation of light fractions of the oil. Furthermore, the heavy oil must be cleaned of suspended water and sand if the Saybolt instrument is to be used.

There appears to be no completely satisfactory instrument in general use whereby the viscosity of the very heavy oils, or oil containing sand or water, may be obtained directly. However, instruments which utilize a vibrating reed or torsion principle are being developed and show considerable promise.

As in the case of gravity determination, an approximate viscosity can be obtained by dilution methods together with the use of a chart[1] prepared by the A.S.T.M.

The viscosities of two or more blends of native oil and a diluent oil are plotted against the volume fraction of native oil in the blends. Then a line through these points is extended to the viscosity of the undiluted oil.

Correlations of viscosity vs. A.P.I. gravity have been made in the past[2] for oil of greater than 12° A.P.I. An attempt to correlate viscosity vs. A.P.I. gravity for heavy oil is shown in the left portion of Fig. 1.

The viscosity - temperature relationship for some of the oils is shown in the right side of the figure.

Dissolved gas . . . The amount of gas dissolved in very heavy oils at reservoir conditions is not well known. Some data[2] indicate it to be in the range of 25 to 200 cu. ft. per barrel. Data shown in Fig. 2[3] for a 12° oil indicate that even a small amount of dissolved gas lowers viscosity a great deal.

The viscosity ratio of formation oil to formation water is extremely high. For the 12° A.P.I. crude for which data are shown in Fig. 2 the viscosity ratio at 1,100 psi. would be about 520 to 1.

Gas associated with heavy oil often contains large amounts of carbon dioxide and hydrogen sulfide. In one extreme case near Santa Maria a gas analysis shows, by volume: 39.5 per cent CO_2, 23.0 per cent H_2S, 23.1 per cent CH_4, 14.4 per cent C_2H_6. Such gas is corrosive and extremely hazardous to personnel. Lethal hydrogen sulfide concentrations are often found in tank vapors. In such cases gas masks and safety equipment are provided to prevent casualties.

Reservoirs

So far as is now known, there is nothing unusual about the structure of reservoirs in which heavy oil is found. Most of the usual types common to lighter oils are represented. In no cases has heavy oil been produced from the bottom of a syncline or other inverted reservoir. This is to say, that the heaviest oil now produced, with a gravity as low as 6° A.P.I. is at reservoir conditions lighter than the accompanying water.

All of the commercially productive reservoirs are alike in being in highly permeable rock. Six of the nine reservoirs considered consist of hard siliceous shales and cherts with a fracture type of porosity. Fracture porosity may range from a very few per cent to as much as 15 per cent. It is usually agreed, as indicated by Hoots[4], that oil in these fractured Miocene shales has originated within them, and probably has not migrated over large distances. In the fracture reservoirs the productive intervals are as much as 2,000 ft. thick. In such cases sustained pumping rates have been as much as 550 bbl. per day per well of 6.9° oil.

In Guadalupe and San Ardo fields oil of 10° to 12° is produced from 30 to 250 ft. of unconsolidated sand of high permeability. Measured permeability values range from 1 to 10 darcies. However, calculated permeabilities for the reservoir and production conditions existing at Guadalupe indicate a permeability of about 200

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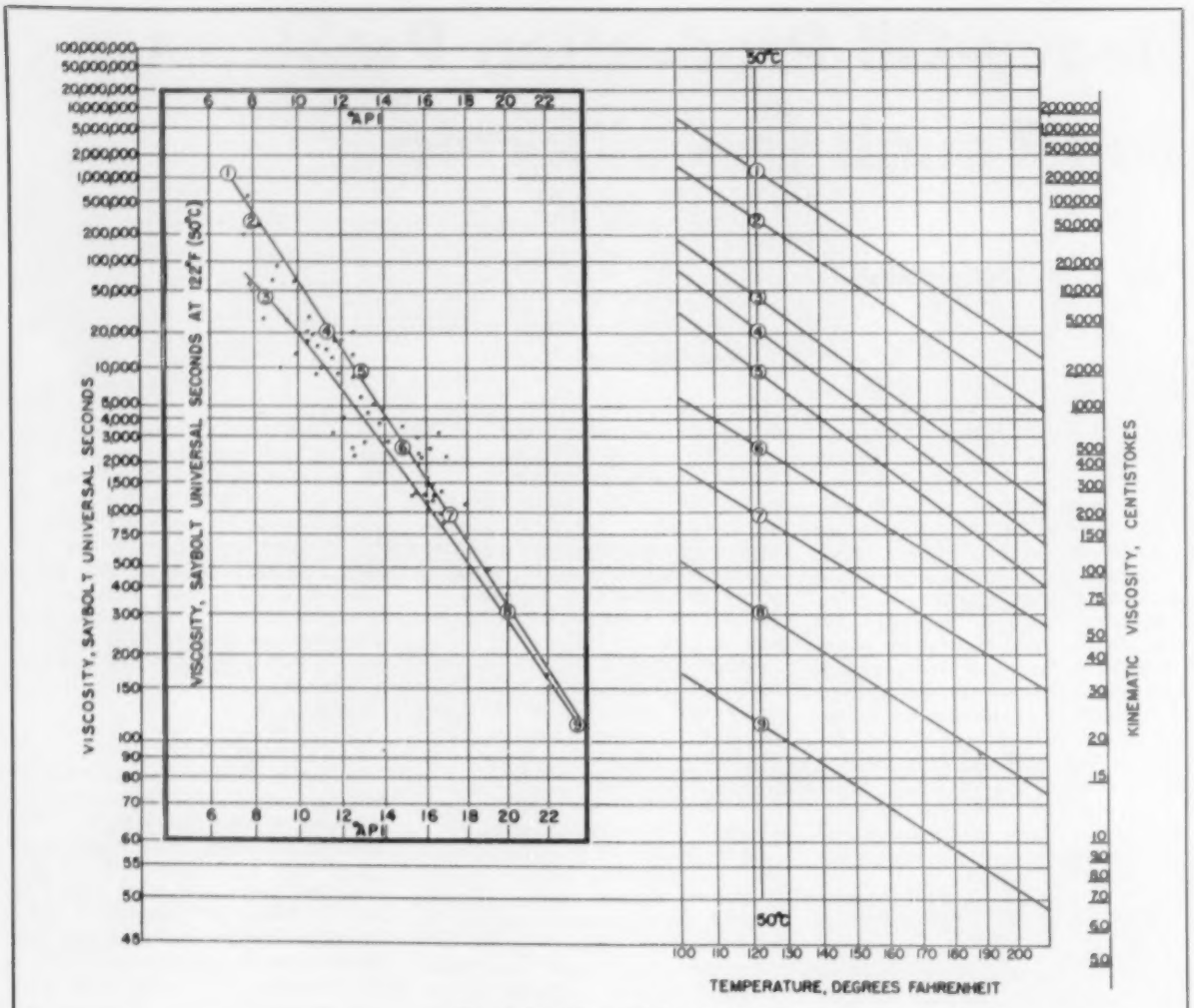

Fig. 1—Viscosity-correlation chart.

1. 6.9° Olivera Canyon; 7.0° Zaca Creek
2. 7.9° Cat Canyon—Light gas oil free resid from distillation of 20.6° crude
3. 8.5° Jesus Maria
4. 11.3° San Ardo
5. 12.9° Leoprechting, Austria
6. 14.8° Santa Maria Valley
7. 17.1° Santa Maria Valley
8. 20° Lompoc
9. 23.5° Orcutt

md. Porosity in the unconsolidated sand reservoirs range from 25 to 35 per cent. Interstitial water is believed to amount to 10 to 25 per cent of the pore space.

In all the heavy-oil fields herein discussed original reservoir pressure is thought to have been nearly equal to a normal water gradient of 0.43 psi. per foot of depth.

Depth of productive zones range from 1,200 to 7,000 ft. Reservoir temperatures range from 104° to in excess of 200° F.

Recovery of oil . . . The mechanisms of oil displacement is in most cases probably a combination of oil expansion, solution drive, and water encroachment. The ultimate recovery of oil is unknown, but usually is expected to be well under 15 per cent of the oil volume originally in place.

A study made of the total Santa Maria Valley field[5] which is a fracture reservoir with average tank-oil gravity of 14.5° A.P.I. and 170° F. average reservoir temperature, indicates an expected ultimate recovery of less than 40 bbl. per acre-foot of interval open to production. Recovery of oil of lower than 14.5° gravity is expected to be even less, mainly because of the unfavorable ratio of the mobilities of the driving fluid and the oil, together with the nearly equal densities of water and oil. If water drive is active, fingering edge water or coning[6] bottom water

Engineering at Midyear

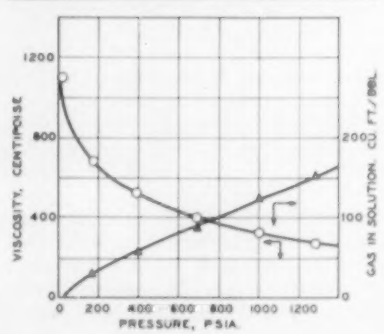

Fig. 2—Viscosity and gas in solution vs. pressure, 12° A.P.I. Guadalupe crude at reservoir temperature of 131° F.

may rapidly take over wells. The difficulties of coning bottom water are well illustrated in San Ardo field[7] where the bottoms of all wells are kept at least 75 ft. above the oil-water interface in order to minimize coning.

Heavy-Oil Production

A few very heavy-oil wells will flow but these are exceptions. The usual heavy-oil well must be pumped. In the early days before the present long-stroke, slow-motion pumping units were developed, very heavy oil was thought to be unpumpable.[8] About 1915 production of 10° A.P.I. oil was achieved by gas lift. Gas or occasionally air (explosions and fire were in the latter case not uncommon) was injected at a pressure of 650 to 1,500 psi.

The consideration of prime importance in selection of pumping equipment is capacity. Equipment must be capable of withstanding overloading which results when production is temporarily stopped and lead lines and tubing in the upper part of the hole become cooled.

Pumping equipment should be designed to achieve the desired production at relatively slow speeds. Usually the more viscous the oil, the slower the pumping units will be running.

Pumping equipment . . . Commonly used pumping units range upward from about 12,000 lb. polished-rod load capacity to the largest units of 40,000-lb. capacity. Stroke length ranges from 24 to 144 in. Requirements range from as low as 5-hp. motors up to 150-hp. engines. Cost of unit and prime mover ranges from $2,500 for equipment capable of 100 lb. per day to over $20,000 for the largest units capable of lifting in excess of 500 bbl. per day.

Tubing used is usually external upset with the size ranging from 3 to 4 in. i.d., although pipe as large as 6⅝-in. o.d. has been used. Four-inch external upset tubing is about the practical maximum size that can be conveniently handled with conventional well-pulling equipment. Rod size depends upon the load and volume requirement.

Pump-bore sizes range upward to as much as 4¾ in.; however, 2½ to 3½-in. are most frequently used. Ball-type pump valves with balls ⅛ to ¼ in. smaller in diameter for a given seat size than the regular A.P.I. valve are normally used. It has been found that for efficient valve action it is desirable to limit the distance the ball may travel away from the valve seat to the minimum.

Pumping the oil . . . The pumpability of heavy oil depends upon its viscosity. With the usual temperature gradient and about 50 to 100 bbl. per day of production, about the lowest gravity oil that can be produced by conventional methods without excessive trouble is about 10.5° A.P.I. This corresponds to a maximum viscosity in the range of 5,000 to 10,000 cp. in the upper part of the hole.

In very heavy oils or under adverse conditions of temperature or volume it is necessary to reduce the oil viscosity. Three methods have been proposed, two of which are widely used:

1. Viscosity reduction may be accomplished by application of heat. Some methods are: an electrical heater or heaters placed appropriately, or electricity passed down the rods or tubing and back up the tubing or casing, heating the tubing because of its own electrical resistance. A hot fluid may be circulated in a loop alongside the tubing. Steam may be injected through a single line beside the tubing, and out through the open lower end into the well bore.

2. Viscosity reduction can be achieved by the use of surface active agents to suspend the oil in water.[9] This scheme has been used down the hole

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in conjunction with the regular use of light-oil diluent in order to reduce the required volume of diluent oil, as well as in surface pipelines to reduce viscosity without the use of a diluent.

3. Viscosity reduction can be achieved by the addition of a diluent oil.

All of these methods have certain advantages, disadvantages, and limitations. The use of a diluent is often selected because of its permanent action in viscosity reduction and the consequent benefit to all succeeding operations.

In the production of very heavy oil one of the most helpful operating guides is the periodic observation of the fluid level in the well bore. This is usually conventionally done with an instrument which uses the sonic echo principle.[10 11] While often useful in the operation of lighter oil wells, fluid-level data are especially useful with very viscous oil because the operator cannot tell by the action of the pump rods when the fluid level is at the pump intake.

Metering, cleaning, and transportation of very heavy oil are sometimes difficult if viscosity reduction in the well has been achieved by temporary means, or if other conditions permit production of oil which at surface conditions has a high viscosity and specific gravity.

Flow indicators of the positive-displacement type have often been used to indicate well production. One difficulty with this type meter is that produced gas, as well as oil, will cause the meter to rotate. In lighter oil, this may be relieved by a small gas separator ahead of the meter but in heavy oil the gas does not separate readily from the oil and gas separators are of little use.

Weigh meters are sometimes used satisfactorily where the viscosity of the oil is low enough to allow the oil to drain from the weight meter. Incomplete draining and accumulation of sand or other material in the bucket influence the accuracy of the measurement.

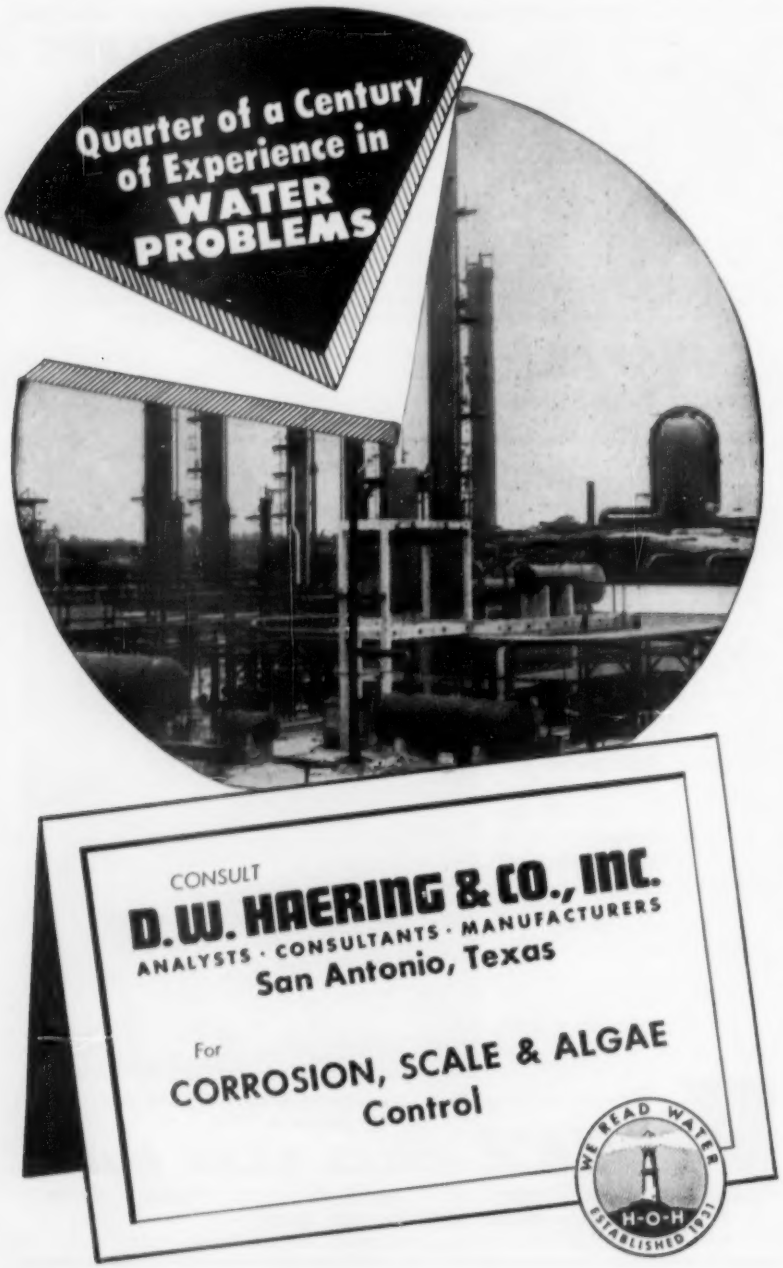
In undiluted very heavy oil the only solution to metering is to produce at least periodically into individual tanks. These, of course, must contain heating coils to maintain the oil in fluid condition.

Water and sand must be removed . . . Cleaning oil is very difficult when viscosity is high and the density of the oil is nearly the same as that of the produced water. Dehydration to below the permissible maximum water content of 3 per cent is accomplished in a batch-type operation at atmospheric pressure and elevated temperature by the addition of suitable emulsion-breaking chemicals and a period of gravity separation. In order to successfully clean oil by gravity separation there must be an appreciable density difference between the oil and water. Perhaps equally important, the viscosity of the oil must be low enough to allow water and sand to settle at a reasonable rate.

Experience shows that this separation in oil of less than 10° A.P.I. requires heat and diluent. The degree of heating of the oil is limited by the boiling point of the entrained water. If this is exceeded a severe boilover of the tanks may occur.

At Oxnard where the entrained water contains about 1,500 grains per gallon of salt, oil of 10.5° A.P.I. is successfully dehydrated at 180° F. within a reasonable time. This is equivalent to a specific gravity difference at that temperature of about 0.032 and an oil viscosity of about 400 cp. The usual gravity separation operation requires oil of somewhat higher gravity, 11.5° to 13° A. P.I. and temperatures about 170° to 190° F.

Electrical dehydration[12] methods may also be used satisfactorily. An advan-



tageous feature found in electrical dehydration is that here the dehydration system is closed and works at pressures up to 50 psi. This permits heating the oil without losing light ends to the atmosphere, thus allowing a higher gravity and lower viscosity to be maintained.

Where sizable amounts of sand are produced, desanding is often carried out as an operation in addition to and separate from the usual dehydration operation, for otherwise, it would be necessary to often clean the oil heaters, dehydration, or shipping tanks of settled sand.

The usual desanding procedure consists of bringing previously heated oil into intimate contact with hot water; by this procedure the sand which is entrained in the oil and which is perferentially water wet is allowed to enter the water phase. Here it settles rapidly into a cone bottom to be drawn off at appropriate intervals.

The removal of entrained gas from heavy oil would be very difficult were it not for the usual condition that comparatively little gas is associated with the very heavy oils. Due to high viscosity and the long time required for gas and oil to separate, the usual type of gas separator is not effective if used before the oil is heated.

Transporting the oil . . . Transportation of heavy oils may be by any of the conventional methods, each method having limitations and advantages under certain conditions.

Truck transportation is often somewhat expensive per unit moved but it is sometimes the most desirable transportation method because of the comparatively low initial investment where produced volume is low or where future demand or producible oil volume is uncertain. At Oxnard[13] oil of 6.9° A.P.I. heated to 215° F. is trucked.

In order to justify installation of a pipeline, adequate expected future volume is required. At San Ardo[7] about 30,000 bbl. per day of 14.5° blended oil is being transported 40 miles through an 8-in.-diameter line.

It is noteworthy that transportation often requires a lower viscosity than does production. In such cases the permanent reduction in viscosity afforded by a diluent may be required. Where diluent is required for transportation, the diluent is ofen added to the oil at, or in the wells in order to take advantage of its viscosity reduction throughout the production and transportation history.

Economics of Very Heavy Oil

Due to less competition or other reasons, exploration costs and land acquisition costs are sometimes lower for heavy oil than for light oil. However, the percentage of heavy oil in place which is recoverable may be very low. Production and treating facilities for heavy oil are likely to cost two to four times as much as light-oil facilities.

Operating expenses are higher where heavy oil is produced. When it is necessary to pull rods and tubing and clean out a heavy-oil well it is always more time consuming and expensive than for a comparable light oil well. Where diluent is required it may be necessary to purchase it from outside sources.

Often, the diluent is degraded by the constituents of the crude, (for example, sulfur), so that its proportionate value may not be realized with the sale of the blended oil. Production costs which range from $7 to $10 per well-day for light-oil wells may range from $15 to $40 per well-day for comparable heavy-oil wells.

Market value of heavy oils . . . The selling price in California of very heavy crude is low. During the past 20 years the price of 11° A.P.I. Santa Maria

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type crude has averaged only 56 per cent that of a 27° Signal Hill crude. The reasons for this are in large part due to the balance existing in the West Coast marketing area between supply and demand for heavy and light refinery products. In this area there is basically a higher volume demand for gasoline and diesel oil than there is for the residual fractions of refining, the fuel oils and asphalts. Tending to aggravate this situation is the condition that the average yield of residual products in California, which is over 37 per cent, is more than double the United States average.[14]

The demand for very heavy crudes which have little or no gasoline and little midbarrel fractions has been tied to the existing asphalt and emergency fuel-oil demand. There is normally little or no demand for the vary heavy crudes in the manufacture of fuel oil, for because of their high viscosity they must be upgraded as by blending with much more valuable gas oil to attain fuel-oil specifications. The amount of gas oil that would be required for upgrading ranges from 20 to 50 bbl. per 100 bbl. of blended fuel oil. With the existing price of gas-oil about three times that of fuel oil this is not done.

With the relative simple refining required to produce asphalt many of the smaller heavy-crude producers sell their product directly to nearby asphalt plants. When the refinery is close enough, this provides a convenient method whereby diluent used in production may be continuously recovered and reused. However, because the asphalt market is limited in its volume requirement, and is keenly competitive, an increased outlet for heavy crude does not appear to exist in this field.

The main hope for an increased market for heavy crude appears to be in new refining facilities, in which increased yields of light products may be realized from heavy chude. The required processes such as coking, catalytic hydrodesulfurization, catalytic cracking and catalytic reforming are known and are beginning to be used. The question that is as yet unanswered and which perhaps holds the key to increased heavy-oil demand is whether refiners can afford the huge investment required in new facilities in the face of competition from existing facilities operating on higher gravity oil.

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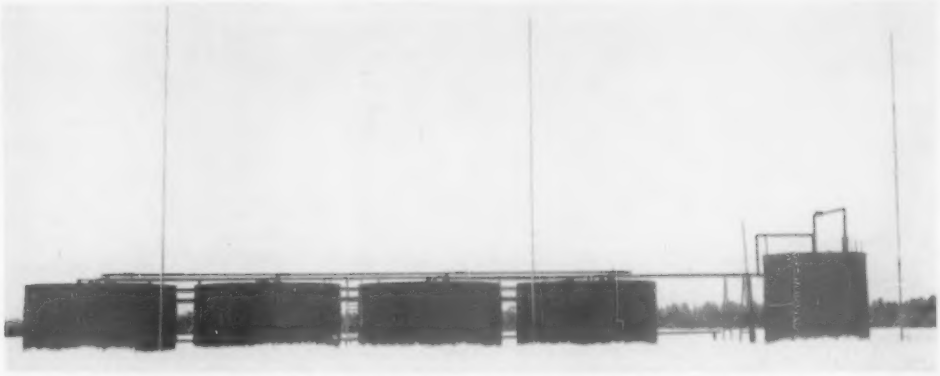
Bibliography

1. A.S.T.M. Standard Viscosity, Temperature Charts for Liquid Petroleum Products, D341-43.
2. Carlton Beal: Viscosity of Air, Water, Natural Gas, Crude Oil and Its Associated Gases at Oil Field Temperatures and Pressures, Trans. A.I.M.E. 165, Petroleum Dev. Tech. (1946).
3. J. F. Wilson: Union Oil Co. Research Division.
4. H. W. Hoots: Origin, Migration, and Accumulation of Oil in California, Bull. No. 118, Geologic Formations and Economic Development of the Oil and Gas Fields of California, California State Div. of Mines (1943).
5. D. E. Evert: Unpublished 1950 Union Oil Co. report concerning Santa Maria Valley Oil Field.
6. M. G. Arthur: Fingering and Coning of Water and Gas in Homogeneous Oil Sand, Trans. A.I.M.E. 155, Petroleum Dev. Tech. (1944).
7. H. O. Miller: San Ardo Field—A History of Development, J. Petroleum Tech. (Jan.) (1953).
8. R. K. Cross: East Cat Canyon Area of Cat Canyon Oil Field, California State Div. Mines Bull. No. 118.
9. William Woelflin: The Viscosity of Crude Oil Emulsions, A.P.I. Drilling and Production Practice (1942).
10. C. P. Walker: Determination of Fluid Level in Oil Wells by the Pressure-Wave Echo Method, Trans. A.I.M.E. 123, Petroleum Dev. Tech. (1937).
11. J. J. Jakosky: Bottom-Hole Measurements in Pumping Wells, Trans. A.I.M.E. 132, Petrolem Dev. Tech. (1939).
12. R. L. Pettefer: Electric Dehydration of Heavy Crudes, World Oil, (Jan.) (1952).
13. Anon.: Hot Water Circulation Facilitates Production of Heavy Oil, California Oil World (First issue, Oct. 1944).
14. Anon.: Outlook for the Heavy Oil Producer, Petroleum World, June 25, (1953).



Lightning protection followed five tank-battery fires during a 3-year period. This is believed to be the first large-scale application to the protection of leases crude-oil storage. Fig. 2.

Lightning Rods Protect Wooden Lease Tanks

by M. R. Taylor and R. M. Stuntz, Jr.

LIGHTNING rods in the form of tall masts of steel pipe are being employed by Gulf Oil Corp. in Kansas to protect lease tank batteries containing one or more wooden tanks.

Although lightning protection has been used for many years for tall structures, houses, and farm buildings, this is the first reported large-scale application to the protection of lease crude-oil storage.

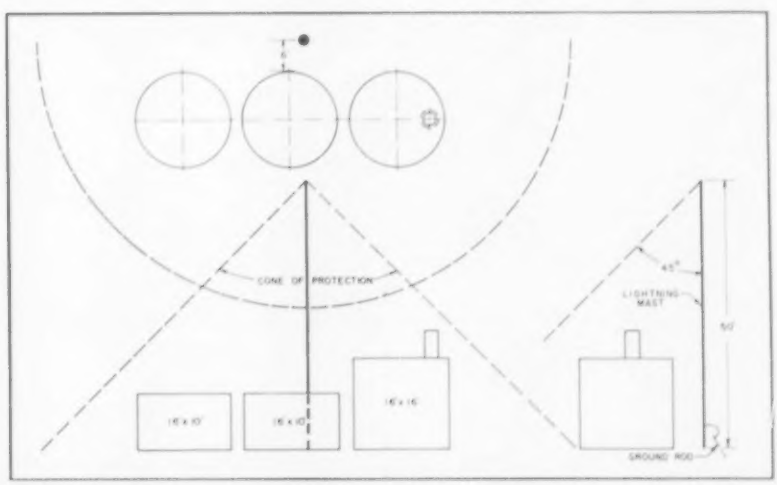
This installation of lightning protection was initiated as a result of five tank-battery fires during the 3-year period 1948-1951. These fires, which were started by lightning, resulted in considerable damage to tankage and loss of valuable contents.

Authors are with Gulf Oil Corp., Taylor is located at Chase, Kansas, and Stuntz is in the Tulsa office.

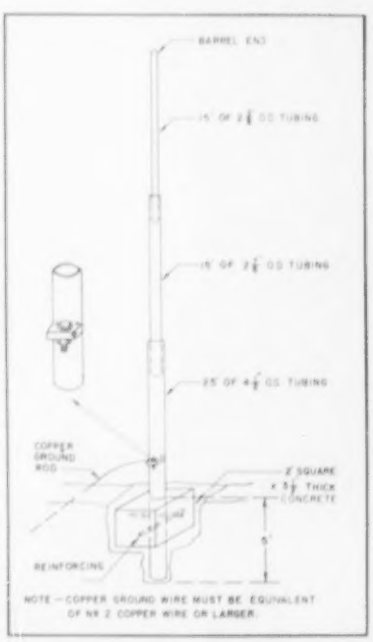
Other companies in this general area also suffered losses during this period. Loss from lightning strokes comes as no surprise for according to government publications thunderstorms are somewhat more severe and more frequent in this general area than in many parts of the country.

Why protection . . . When thunderstorms occur, atmospheric conditions are such that electric potentials are set up between clouds, or between clouds and the earth. When the electrical potential reaches a certain limit, the resistance of the atmosphere is overcome and a lightning stroke results. It is for this discharge that lightning protection systems are used to transmit the resultant electric spark of tremendous violence to the earth without damaging effects.

The fundamental theory of lightning protection for structures is to provide means by which a discharge may enter the earth without passing through a nonconducting part of the structure. Damage from lightning is caused by the heat and mechanical forces gene-



LAYOUT of lightning protection for complete wood tank battery using one 50-ft. mast. Fig. 1.


BARREL END
15' OF 2½" OD TUBING
15' OF 3½" OD TUBING
25' OF 4½" OD TUBING
COPPER GROUND ROD
2' SQUARE x 3½' THICK CONCRETE
REINFORCING
NOTE — COPPER GROUND WIRE MUST BE EQUIVALENT OF NR 2 COPPER WIRE OR LARGER

LAYOUT for 50-ft. lightning-protection mast. Fig. 3.

rated in such nonconducting materials, whereas in metal parts these forces are distributed throughout the surface due to the conductivity of metal. Hence, if metal parts are provided of proper proportion and distribution, damage can be largely prevented.

The degree of protection afforded by steel tanks is from all indications sufficient, assuming that the installations are properly grounded and that the tanks are properly vented. Usually tanks are placed on sand, gravel, or concrete, which prevents good electrical contact with the ground. However, pipelines running from each tank to the ground are sufficient protection in most instances even though the tank proper is insulated from the ground.

Wood tanks . . . In regard to wood tanks, they definitely do not comply with the qualifications set up in all-steel tanks as to lightning protection. The wood tanks should have a complete shielding system if any degree of protection from lightning damage is to be realized. This type of system not only eliminates the hazard of a direct bolt, but also eliminates the hazard of induced sparking.

From information available in government publications on lightning protection it was found that an overhead vertical mast would suffice as a shielding system and provide a cone of protection diverging 40° to 45° from the vertical as shown in the sketch, Fig. 1.

In late 1951, following investigation of lightning protection practices, 91 tank batteries on Gulf Oil leases in Kansas were protected through installation of 121 steel-pipe masts. The concept of protection employed as explained above is based on a tepee-like cone of protection about each mast.

Some tank batteries cover sufficient area to require protection afforded by several masts and their overlapping cones of protection as shown in the photograph depicting a typical tank battery lightning protection application. Fig. 2.

Masts . . . The masts normally used are approximately 50 ft. high and are fabricated in three sections as shown in the sketch, Fig. 3, utilizing a 25-ft. section of 4½-in. o.d. tubing, a 15-ft. section of 2⅞-in. o.d. tubing, and a 15-ft. section of 2⅜-in. o.d. tubing. The 2⅜ and 2⅞-in. sections are joined by machining the upset end of the 2⅜-in. tubing to fit inside the 2⅞-in. section.

The 2⅞-in. section and the 4½-in. section are joined in a similar manner, except a collar is used in order to secure a centralized, tight fit between the sections. The collar is joined to the 2⅞-in. section by welding at the bottom of the collar. All masts are connected to copper ground rods with No. 2 copper conductors or equivalent.

Since installation of lightning protection no fire losses attributed to lightning have occurred at the protected tank batteries. Based on losses suffered during the 3-year period, the expense of installing lightning protection at these tank batteries is indicated to have been paid out in less than 2 years.

It has been reported that other operators in the vicinity of the protected leases have suffered numerous fires from this cause. In all probability the reported fires represent only a small portion of the fires originating from lightning occurring in the state of Kansas. As a result of the apparent success achieved in these installations, several other operators have made or are considering similar protection.

References

"Code for Protection Against Lightning," Handbook 46—National Bureau of Standards.
"Code for Protection Against Lightning," Standards No. 78—National Fire Protection Association.

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McCullough Service Crew made 17 runs with 3½" O.D. double 20-shot M-3 Guns, 14 runs with 3½" O.D. double 10-shot M-3 Guns and 8 runs with 3½" O.D. M-3 Guns one shot every two feet—a total of 39 runs in 39½ hours rig time.

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Unretouched photo above shows three string penetration by ½" Ogival Bullet with exclusive McCullough Burrless Bullet Cap. Note smooth, burr-free inner surface of pipe.

Average penetration into special targets: McCullough, 5¼"; Company A, 4⅛"; Company B, 4⅛".

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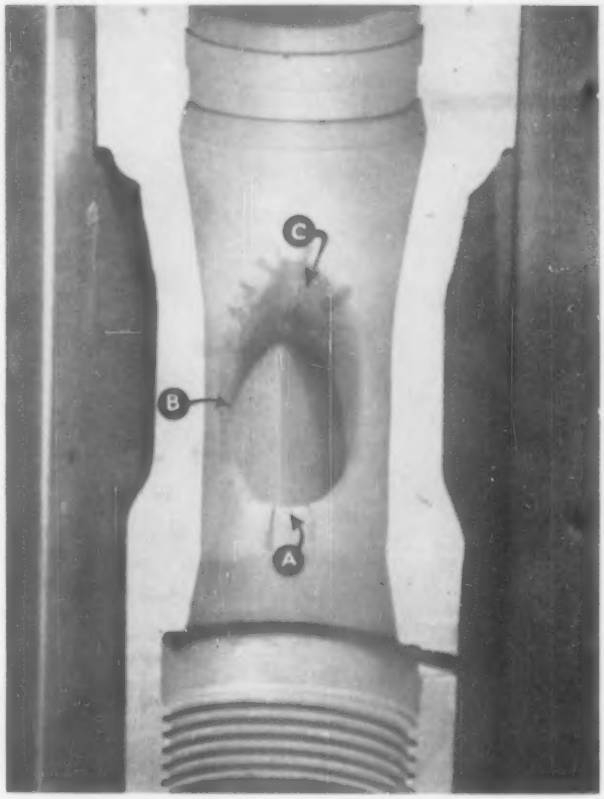
TENSILE-TEST FAILURES of eyebolt designs for mechanical seals. Bolt at top is of "eccentric eye" design; bending and typical failure in last thread were caused by eccentric loading. Fig. 1.



SECTION through 18-8 Cr-Ni furnace header which failed. Crack penetrated halfway through the ⅞-in. wall thickness. Header had been in service since 1938 processing a naphtha stock at 900° F. Fig. 4.

Humble's Metallurgical Group—1

This Group Goes Looking for Trouble

. . . and for means of coping with it in the future

by F. Lawrence Resen
Gulf Coast Refining Editor

THE metallurgical group at Humble Oil & Refining Co.'s Baytown, Tex., refinery plays an important part in the refiner's maintenance activities. Duties include inspection of plant equipment; solving corrosion and metallurgy problems; and working out metallurgy, welding, and heat-treatment procedures. The group selects materials of construction for the various refinery services, both in maintenance work and in new construction.

The contribution of this organization to the refinery-maintenance program can best be understood by considering some typical case histories. This four-part series is devoted to studies made on furnace headers in high-temperature service, metallurgical studies of the Hydroformer, work done on a regenerated-catalyst hopper, and several other problems encountered and solved by the group.

Tests and equipment . . . Various destructive tests are conducted at the metallurgical laboratory, to determine such factors as compression, impact, and tensile strength. Nondestructive testing of various items is done with the test equipment as follows:

1. Gamma ray instrument. Uses radioactive material to determine wall thicknesses up to ¾-in. It may be used to check vessels, piping, and tubes to determine accurately general metal loss.

2. Magnetic-particle inspection. Used in locating and tracing cracks and other defects in operating equipment and for the quality control of new welds. It is used as a standard inspection technique on spheres and spheroids to insure that no incipient cracks exist.

Small tools, such as mauls, chipping hammers, and impact wrenches are inspected. The test pin points defective items which are definite safety hazards. The tests are conducted on both new and used tools.

3. Portable X-ray machine. Used for weld-quality control. It is also used

in the fabrication of small vessels and in the inspection of castings to determine condition and the feasibility of making economical repairs.

Teflon insulators used on crude-oil desalters are X-rayed before these are fabricated from bar stock. If voids exist in the material, the piece must be discarded. Voids are readily determined by X-raying prior to machining.

4. Penetrant testing. Uses fluorescent and dye penetration methods for locating cracks in nonmagnetic material. These are used in inspecting furnace tubes and stainless-steel vessels for surface cracks, voids, and other defects.

Pump eyebolts . . . During a recent program to strengthen mechanical-seal-holding members on centrifugal pumps, tensile tests of pump-gland eyebolts were made to establish the best design procedures.

Originally each replacement eyebolt was designed with the eye portion as heavy as the shank. This feature was adopted to eliminate the possibility of a field mechanic overstressing the eye, which was hidden from view in a majority of pump installations. It was specified that the cross-sectional area of the eye not be less than the bolt area at the root of the threads.

While this specification was satisfactory from strength consideration, it led to difficulty in some installations because of space limitations. Consequently, tests were conducted to determine the best design for eyebolts. These are the findings:

1. A cross-section area of the eye equal to 80 per cent of the cross-sectional area at the root of the threads is adequate to develop the full strength of eyebolts. The cross-section should be rectangular in shape in order to secure the necessary area while keeping the outside diameter of the eye at a minimum.

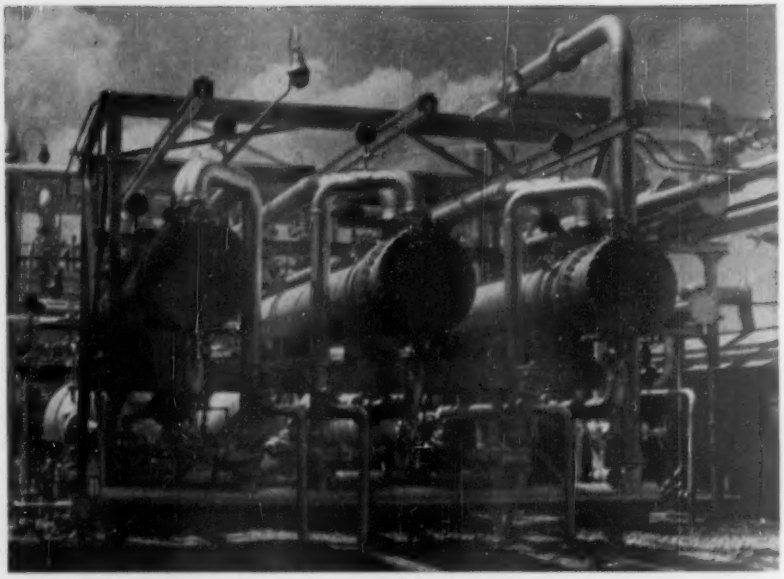
2. A smooth ⅛-in. radius fillet should be provided at the junction of eye and shank of the bolt.

3. The maximum clearance between eye and through-bolt should not exceed 3/64 in.

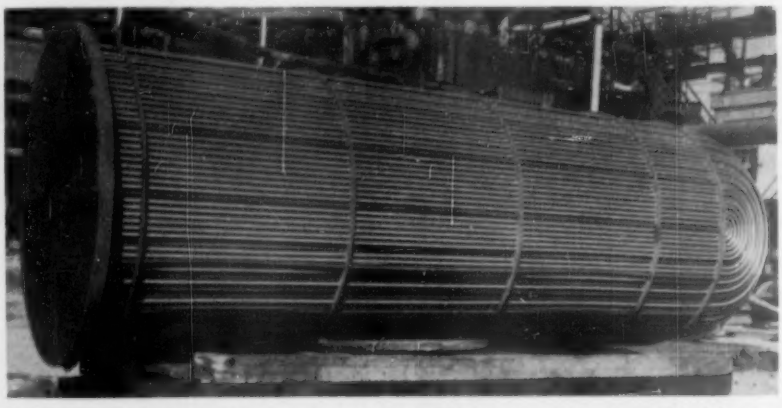
4. The bolts should be magnetic-particle inspected after heat treatment to detect flaws or cracks.

These design principles were also applied to the design of eyebolts for pumps utilizing conventional packing. Field experience has shown that installation of eyebolts designed in accordance with these principles is feasible on nearly all makes and models of pumps used at Baytown.

Gas coolers . . . Nine gas coolers at a booster station were replaced by three coolers of equivalent capacity. Serious corrosion and fouling difficulties had been experienced with the replaced equipment, which consisted of cast-iron shells and admiralty tube bundles. The exchangers are downstream from the compressors which deliver gas from the crude stills to the low-pressure recovery system in the absorption plant. They had been heavily attacked by hydrogen sulfide.



THESE THREE GAS COOLERS at a booster station were used to replace nine coolers of equivalent capacity which had been severely attacked by hydrogen sulfide. Cast-iron shells and admiralty tube bundles were replaced with 18-8 bundles and 18-8 clad steel shells. Fig. 2.



FOULING WAS REDUCED and cleaning by sandblasting was easily accomplished because of reduced scale and wider cleaning lanes on this reboiler tube bundle. Fig. 3.

Scale formation, together with general dezincification on the gas (shell) side, limited the average life of the admiralty bundles to approximately 1 year—one bundle lasted only 6 months. In addition, down time for cleaning or repair was necessary at 6-month intervals.

Choice of 18-8 Cr-Ni as replacement material was based on the previous favorable experience with two 18-8 (Type 304) stainless-steel tube bundles. These had given 6-6½ years service with greatly reduced fouling rates. The new coolers constructed with 18-8 tube bundles and 18-8 clad steel shells, cost 40 per cent more than exchangers with cast-iron shells and admiralty tubes. However, the increased investment was justified by a sixfold increase in service life and by a marked reduction in repetitive cleaning expense.

Tube reboiler . . . An 18-8 Cr-Ni (Type 304) stainless steel U-tube bundle was installed in a reboiler in May 1950. The bundle, used in a distillation unit rerunning aviation gasoline, contained 941 U-bend tubes, ⅝-in. o.d. by 16 BWG on a 1-in. layout and square pitch. It replaced a carbon-steel bundle

of conventional floating tube sheet design.

The carbon steel tubes had experienced severe fouling in this service after a few months' operation. Deposits on the tube exteriors resulted from a reaction between an organic acid and iron salts. The scale was hard and clung tenaciously to the metal, making removal especially difficult. Chemical cleaning was not tried because one chemical cleaning concern reported its laboratories could not dissolve the deposit.

Narrow cleaning lanes (¼ in. wide) added to cleaning troubles. Sandblasting proved ineffectual, and crosscut saws, scraper blades, and water washing were tried with varying degrees of success. In some instances cleaning was accomplished, although a minimum of 150 man-hours per operation was required. On two occasions, the deposits could not be removed, and the bundle had to be retubed.

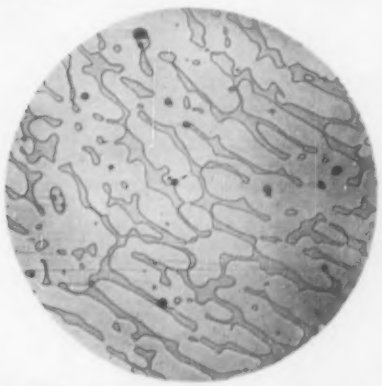
Inspection of the new 18-8 bundle after 11 months' service revealed that changes in material and design had corrected these difficulties. The tubes were in good condition. Fouling was reduced and cleaning by sandblasting was easily accomplished both because of reduced scale and wider (⅜-in.) cleaning lanes. Testing in the shell was completed satisfactorily and quickly because of the U-tube arrangement.

The cost of the alloy bundle was 2½ times that of steel. However, increased service life alone repays the greater investment in 28 months, irrespective of the other savings.

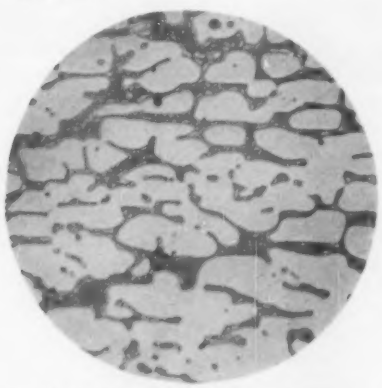
Furnace Header

An investigation was made of a

STRUCTURE of metal taken from header. (250 diameters). Fig. 5.



STRUCTURE of metal after solution annealing. Fig. 6.



STRUCTURE after solution annealing and reheating at 1,200° F. Fig. 7.

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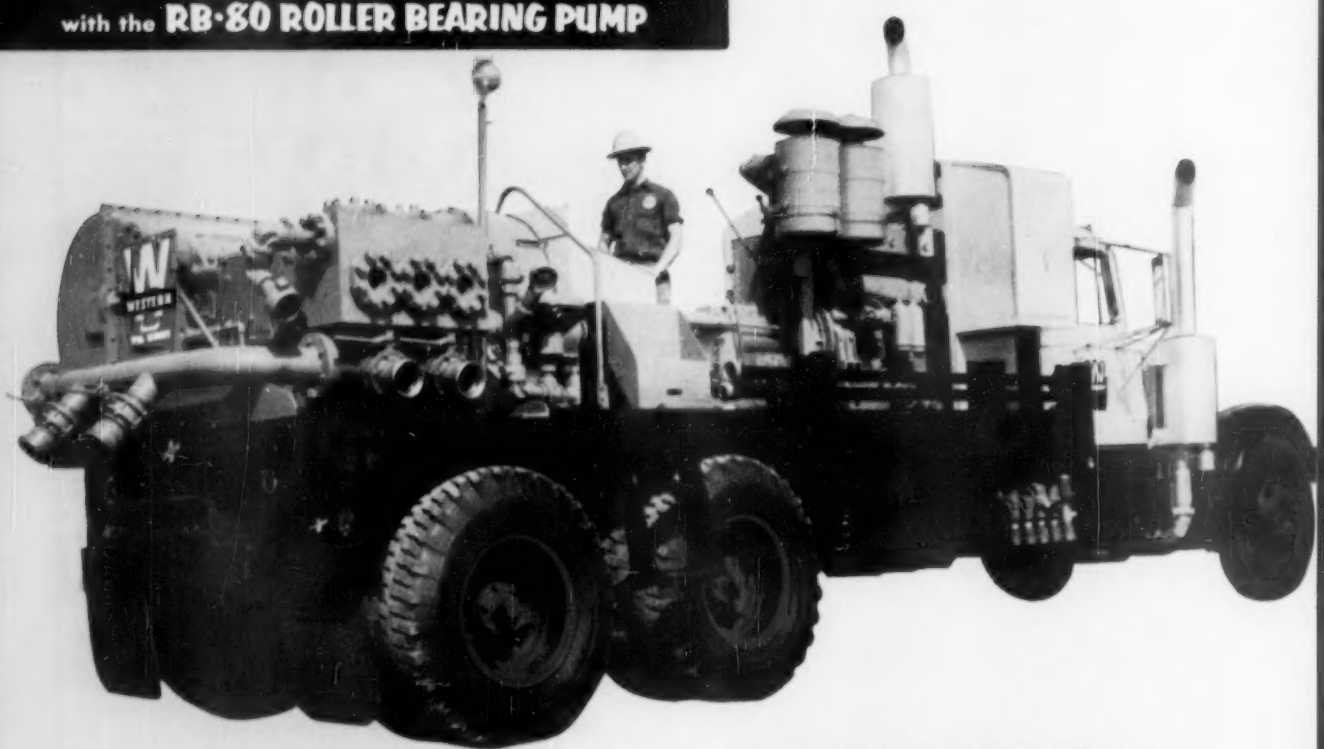

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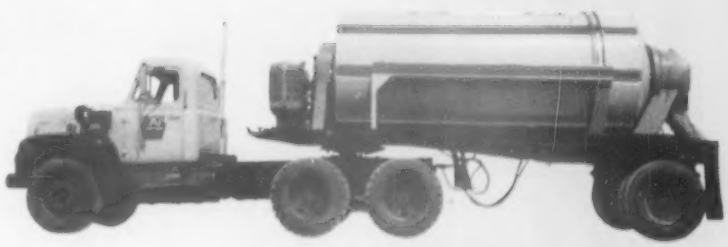

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3½-in. two-way cast 18-8 Cr-Ni steel furnace header from a thermal cracking unit that had failed. During a unit inspection, this header was found to contain a large crack in the crossover between the barrels of the header.

This header had been in service in thermal cracking coils since 1938, processing a naphtha stock at 900° F. and 1,000 psi. It is one of 150 such headers in similar service. A section through the header showing the main crack and numerous smaller cracks is shown in Fig. 4. A section made through the main crack in the crossover showed the crack had penetrated halfway through the ⅞-in. wall thickness.

All of the cracks originated at points of high stress, i.e., the apex of the elliptical crossover and at the corners where the crossover joins the barrels of the header. One crack was found originating from the outside of the crossover at a point 90° from the apex, also a point of high tensile stress.

Microscopic studies . . . Specimens cut from the main crack section were examined microscopically and magnetically tested as received and after various heat treatments. Fig. 5 shows the structure of the metal at 250 diameters. The dark areas consist of numerous small particles. Fig. 6 shows the structure of the metal after solution annealing (heating to 2,050° F. for 1 hour and water quenching). The small particles had been replaced by a light-gray interdenritic structure.

This material was identified as delta ferrite, a magnetic constituent with a body-centered cubic lattice. Fig. 7 shows the structure of solution-annealed specimens after aging at 1,200° F. for 5 days. Figs. 8 and 9 shows the structure after solution annealing and aging at 1,650° F. for 8 hours and 16 hours, respectively. Further aging at 1,200° for 5 days did not alter the structure.

Photomicrographs show these aged specimens to be similar to those of the material as received, but the light-gray particles were progressively larger. These particles were identified as "sigma phase," a hard, brittle, intermetallic compound of iron and chromium possessing very poor physical properties.

Magnetic properties . . . The magnetic properties of this steel in various conditions of heat treatment were roughly determined by holding specimens against the case of a small pocket compass and noting the maximum deflection of the

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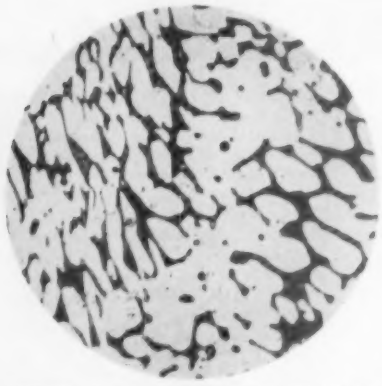
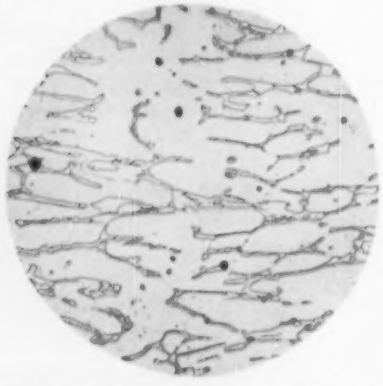


STRUCTURE after heating at 1,650° F. for 8 hours. Fig. 8.



STRUCTURE after heating at 1,650° F. for 16 hours. Fig. 9.

needle. In the event the needle could be deflected a full 90° the specimen was then moved away from the compass case and the maximum distance from the specimen to the case at which the needle could still be deflected 90° was also noted.

The white constituent (austenite), and sigma phase are not magentic. Delta ferrite is magnetic. It is believed that sigma phase is formed from delta ferrite after prolonged exposure at high temperature. The magnetic properties are summarized as follows:

Condition of metal	Compass deflection
As received	43°
Solution annealed	90° + 1/8 in.
Solution annealed + 5 days at 1,200° F.	47°
Solution annealed + 8 hours at 1,600° F.	90°
Solution annealed + 16 hours at 1,600° F.	5°
Solution annealed + 24 hours at 1,600° F.	0°

These data indicated that solution annealing resulted in the formation of delta ferrite which was converted to sigma phase by exposure to high temperatures for a period of time. It appeared that 5 days at 1,200° F. was approximately equivalent to 15 years at 900° F.

Bend tests . . . Bend tests were performed on 1 by ½ by 5-in. samples cut from the header as received, and after various treatments. The solution-annealed sample was bent double around a 1½-in. mandrel with no indication of failure. All of the other samples failed with less than 10° deflection. The above results were expected since delta ferrite is ductile while sigma phase is hard and brittle.

Chemical analyses showed that the material contained 0.05 per cent carbon. Due to the low carbon content and the behavior of heat-treated samples it was not believed that carbide precipitation was an important factor in the failure.

While the problem of sigma phase formation has been widely investigated there is still relatively little information available as to causes and prevention. It is believed to be due to an unbalanced alloy composition containing insufficient austenitic-forming elements to produce a stable alloy. It is easily possible to have an alloy complying with all A.S.T.M. specifications for 18-8 type materials which is not full austenitic and may develop sigma phase. The Battelle Memorial Institute has developed the Battelle formula relating alloy composition to a ratio factor and the ratio factor to the amount of delta ferrite present. Other tests have been developed which measure the amount of delta ferrite by magnetic permeability.

It was recommended as a result of the tests that all 18-8 Cr-Ni type castings for high-temperature service be specified to have a ratio factor as obtained from the Battelle formula of 1.7 or less or a maximum magnetic permeability of 1.05. Information was not sufficiently complete to definitely state that sigma phase will not form from austenite but it is known that it will form much less rapidly from austenite than from delta ferrite.

Conclusions

1. Failure was due to the formation of sigma phase in the alloy, causing the casting to become brittle.

2. No heat treatment is available to prevent sigma phase formation in susceptible material, new or in service.

3. All 18-8 Cr-Ni type castings for high-temperature service should have a ratio factor of 1.7 or less as calculated by the Battelle formula or a magnetic permeability of 1.05 or less as determined by A.S.T.M. standard methods.

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S/K apades in industry

THE CASE OF THE PUNGENT FUMES AND THE PROCESS MAN WITH A PLAN

"Gadzooks!" cried Pete the Process Engineer, as he clamped a clothespin on his nose. "I dever sbelled anythig as obdoxious as doze *sulphurous fumes.*"

The *processing units* kept on fuming—and so did the employees who had to endure the odor.

"Do somethig," gasped the Plant Manager. "Those nauseatig fubes and odors are perbeating the whole fagtory. Peoble turn up their dozes at working here . . ."

Pete went into his office and held his head. A jet unit would alleviate odors and pacify his disgruntled boss. A jet unit, but what kind? And what about hoods, ductwork, recirculating system? A *jet* unit? Yes! No fan to corrode or wear out . . .

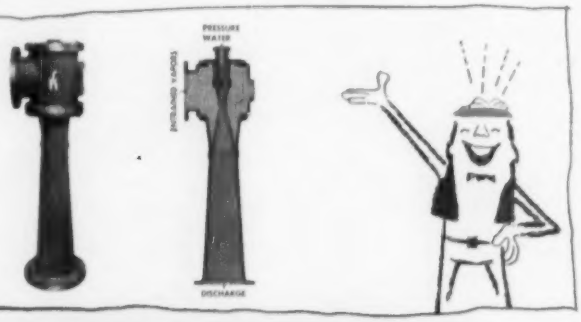
Pete wrote Schutte and Koerting for a copy of new Bulletin J-1 on "Jet Apparatus and Its Industrial Applications." That told him all he needed to know about the varieties, ranges and characteristics of Jet Apparatus.

Bulletin J-1 pinpointed the data he needed. He located the desired function, the types of jets suitable for such a function, the type most suitable for his particular requirements.

Then he phoned for a specialist—his nearby SK Sales Engineer, who came a-running. And from him, Pete got a specific recommendation.

LICKED THE PROBLEM IN A JIFFY!

The SK Fume Scrubber illustrated is used to absorb sulphurous fumes in Pete's refinery. Rubber lined, the unit resists the corrosive action of the fumes. Discharge is made into a separator and clean air is discharged to atmosphere.



MORAL: *Send for a copy of Bulletin J-1 for your files. And make use of a qualified specialist on jet apparatus —your nearest SK Sales Engineer.*

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How to Determine Gas-Production Cost

Accountants for Humble Oil & Refining Co. have developed an energy-content method for allocating gas-production cost. This method yields a fair and equitable unit production cost figure, and promises to find industry-wide application.

by E. E. Hunter

SALES of natural gas by the 4,000 or more producers in the United States rose to an all-time high of 8.7 trillion cubic feet in 1954—representing an aggregate value at the well of about 870 million dollars.

This may have resulted in an over-all profit or it may very well have resulted in a loss. It is very doubtful that anyone can say with any degree of certainty which was the case—and it is almost certain that no one can say how much profit or how much loss was realized.

Perhaps in no other industry has such an important product been produced and marketed with so little information on cost. It is difficult to imagine what kind of problem could present a more immediate or more urgent challenge to those concerned with oil-industry costs than this one.

Products Involved in Allocation

The first question encountered in working out a procedure to allocate producing costs relates to the products. We actually have two generally known types of gas—gas-well gas and casing-head gas. We also have two generally known types of liquids—crude oil and condensate.

The realistic approach from the standpoint of cost determination seems to be that we have four products to be considered: crude oil, casing-head gas, gas-well gas, and condensate.

Measurement of production . . . Another troublesome question encountered in working out a procedure for producing cost allocation involved the definition of gas production for the purpose of computing the allocation factors. The fact that gas is often handled more than once before it is sold or used as fuel is the root of this problem.

Spent gas-lift gas, for instance, should not be included as production for the purpose of this allocation because to include it would have the effect of allocating more cost to gas, while it actually helps reduce the cost of lifting oil. The same thing is true of cycled gas and gas returned to the same reservoir for pressure maintenance.

Flared gas would appear at first to be the type of production that should bear its fair share of the cost, but with conservation practices constantly tightening down on flaring of gas in most states to the point where about the only gas that will be flared in the future is that which is not salable or unsable under any circumstances, this first appearance might be misleading.

If it is not a commercial product it should be considered as a waste product and no costs allocated to it, as such. Stored gas, on the other hand, probably should be considered as production since it is more in the nature of inventory awaiting sale or use.

Taking all these facts into consideration, gas production can be defined as only that part of the total gas handled that is permanently severed from its reservoir and sold, used, or stored.

Types of Costs to be Allocated

Having determined the products for which costs are to be computed and the volume of each produced, the next step was to find the most logical way to segregate the costs. For this purpose costs are naturally divisible into three general categories — direct producing costs, indirect producing costs, and exploration costs.

Direct costs . . . Direct producing costs at Humble include all costs that can be directly traced to the smallest accounting unit, which in most cases is a lease. Examples of these costs are: depreciation, taxes, maintenance, fuel, pumping, reconditioning, etc. These costs are actually segregated by leases—thus making it possible to determine the amount applicable to gas leases and to oil leases.

However, there was no method of allocating these costs between the gas and condensate produced on gas leases. Neither was there a method of segregating the costs applicable to oil leases between the crude oil and the casing-head gas produced.

The method adopted to accomplish the segregation of direct producing costs to the four products is composed of several steps. All direct producing costs applicable to gas leases are allocated between gas-well gas and condensate in proportion to the energy content of each. For this purpose each 1,000 cu. ft. of gas is assumed to contain 1,000,000 B.t.u. and that each barrel of condensate contains 6,000,000 B.t.u. (a figure which may be slightly low).

The direct producing cost per 1,000 cu. ft. of gas-well gas is thus obtained. This unit cost of gas-well gas is considered to be the direct producing cost per 1,000 cu. ft. of casing-head gas produced on oil leases. Total direct producing costs of casing-head gas can then be determined. The total direct producing costs of crude oil is the balance of the total cost attributable to oil leases.

This procedure for costing casing-head gas by reference to the cost of gas-well gas can be justified by the fact that the products are similar in nature even though they happen to exist in different surroundings in the reservoir. The procedure does not allocate as much cost to casing-head gas as would be allocated if the total direct producing cost applicable to oil leases were allocated to crude oil and casing-head gas on the basis of the energy content of each.

This is due to the fact that it costs less to produce a British thermal unit from a gas well than it does from an oil well, due to the wider spacing and more natural flow of gas wells. This procedure, therefore, tends to give a reasonable credit to casing-head gas for its work in lifting crude oil. At the same time it recognizes that some of the direct producing cost is attributable to the casing-head gas produced jointly with the crude oil.

Indirect costs . . . Indirect costs, including division and home-office supervision and staff expenses, present a somewhat different problem because they are not directly related to either oil leases or gas leases. Since these costs are closely related to direct costs, they are allocated in proportion to the amount of direct costs applicable to each product.

There is considerable precedent in ac-

Author is assistant comptroller, Humble Oil & Refining Co., Houston. Paper presented at 1955 Conference of Accountants, University of Tulsa, Tulsa.

"This method was designed for broad application with average costs as the objective rather than for the determination of specific costs for individual fields or leases."

counting practice for this type of allocation.

Exploration cost . . . Exploration cost includes such items as dry-hole costs, lease rentals, surrendered leases, test-well contributions, and all types of geologic, geophysics, and leasing costs. The allocation of exploration cost presents a more difficult question of principle than the other two types of cost, but the size of the expenditures involved makes any cost analysis incomplete without it.

Actually, exploration cost is related to the volume of recoverable hydrocarbons discovered rather than to the volume produced in a given period. However, the accounting concept of exploration cost is much the same as that of research and development costs.

Many industries must, by their very nature, expend considerable sums in research activities in order to remain in a competitive position. In this light, such cost must be viewed as a normal and recurring charge to current operations.

Obviously, the exploration effort of the petroleum industry must be conducted to provide the oil and gas reserves that are necessary for a producing company to stay in business. For this reason most companies have elected to expense exploration cost currently and to consider such cost as a part of the over-all cost of producing oil and gas.

Over the life of a company, the cost per unit would be the same whether related to recoverable discoveries or to production, since the two would ultimately be equal. This expense is allocated to the four joint products in proportion to the aggregate energy or heat content of each.

As in the case of the direct producing cost of gas-well gas and condensate, the basis for allocation is the ratio of 1,000,000 B.t.u. for 1,000 cu. ft. of gas to 6,000,000 B.t.u. for a barrel of liquid.

Allocation Example

The results of the allocation procedure just described can be illustrated by a hypothetical example, which compares the traditional method of allocating all cost to crude oil with the energy content method of allocation:

HYPOTHETICAL EXAMPLE

		Crude oil	Casing-head	Gas-well gas	Condensate
Vol. of production	000's	1,000 bbl.	1,000 M.c.f.	1,000 M.c.f.	1 bbl.
Heat equivalent	000's	1,000 bbl.	167 bbl.	167 bbl.	1 bbl.

	Cost Per Unit					
		Traditional method	Allocated by energy content method (approximate figures)			
	Total cost $000	Crude oil, per bbl.	Crude oil, per bbl.	Casinghead gas per M.c.f.	Gas-well gas per M.c.f.	Condensate, per bbl.
Direct cost--						
Gas leases	$ 60	$1.00			$0.06	$0.36
Oil leases	940		$0.88	$0.06		
Indirect cost	330	.33	.29	.02	.02	.12
Exploration cost	500	.50	.37	.06	.06	.37
Total	$1,830	$1.83	$1.54	$0.14	$0.14	$0.85

Reasons for procedure . . . In the search for principles that would take into account the character of oil and gas-producing operations and would provide reasonably accurate indications of relative costs, two basic methods of allocating costs that could not be directly or indirectly attributed were seriously considered.

We can call these the "Sales Realization Method" and the "Energy Content Method." The latter is one that was adopted, but since the realization method is familiar to so many people, the reasons why it was not adopted will be discussed briefly before discussing the reasons why the energy content method was adopted.

In all the discussion that follows, it should be kept in mind that, while we are talking about general principles of cost allocation, we are talking about them principally as they apply to the allocation of exploration costs.

Except for the allocation of direct producing costs on gas leases to gas-well gas and condensate, and the effect that this has on the distribution of costs between crude oil and casing-head gas, there is no actual application of either the realization method or the energy content method to anything but exploration costs.

Sales-realization method . . The sales-realization method of allocating costs assumes that costs are incurred in proportion to sales value. This method has a fundamental weakness. If the price of one product declines relatively to the price of others, or is not a fair price to start with, the costs allocated to that product are reduced correspondingly—even though there may be no change in the costs incident to the total operation or in the costs involved in handling the individual products.

This is really not so much a method of allocating costs as it is a device for allocating profit or loss according to sales values.

The objections to the sales-realization method can be summed up by saying that since there is no anchor to which costs can be attached, with costs fluctuating solely as a result of price changes, there cannot possibly be any indication of what a product should be selling for to return total cost.

To illustrate the incongruous results that this method can produce, let us assume that gas from a gas well has been going into a transmission system at 5 cents a thousand cubic feet, with a total cost of 4 cents a thousand, including 2 cents a thousand for exploration. The old contract expires and a new contract is made to sell the gas at 20 cents a thousand.

Using the sales-realization method to allocate exploration cost, the exploration cost factor would jump to 8 cents a thousand, and total costs to 10 cents. It is perfectly obvious that the actual total costs applicable to the gas, exclusive of production taxes, would probably not be changed one iota by the change in price.

The Energy-Content Method

The energy-content method of allocating costs is based on the simple fact that the petroleum industry is primarily engaged in supplying energy in the form of heat. This is borne out by the fact that a very small portion of total petroleum production is used for purposes other than fuel and power. Energy is the basic ingredient common to all four of the products that we have been talking about and, as such, is the most logical basis for allocation.

The use of a cost-allocation principle involving physical characteristic is not new or unique. As an example, the chemical industry uses the molecular weight of various joint products in allocating costs of production in some of its plants. The steel industry uses a straight B.t.u. basis for allocating the costs involved in coke manufacture be-

tween the fuel gas and coke that results.

Another line of reasoning in support of the method, which would apply particularly to exploration costs, is that the energy content of the liquid and gaseous fuels derived from oil and gas is closely related to the real or intrinsic value of the material.

This is supported not only by the widespread use of petroleum for fuel and power, but also by the fact that so many new contracts are including specifications for certain heat content in the products delivered. It is reasonable to assume that the effort put forth to find and produce crude oil and gas, and the coproducts of each, is influenced by the relationship of intrinsic values.

Since the expenditure of money is usually very closely related to the effort put forth, it is reasonable to conclude that costs can be divided in the same manner as the effort when there is no more exact means of making a division.

Another reason for use of the energy-content method of cost allocation is its simplicity and stability, since the ratio of heat content is a constant yardstick for cost allocation.

Limitations of Method

There are certain limitations to this method. It was designed for broad application with average costs as the objective rather than for the determination of specific costs for individual fields or leases. The main reason it would not be adaptable to small areas is that some of the factors that are involved in its application would not be present.

An example would be a field that had no gas-well gas production. In this case there would be no criterion for assigning direct producing costs to casing-head gas. Such obstacles are not believed to be insurmountable, however, since it would be possible to assign costs to the casing-head gas that had been determined for production under similar conditions elsewhere.

Or perhaps some formula showing the relationship between the cost of producing a unit of heat from gas wells to the cost of producing a unit of heat from oil wells could be worked out. This ratio could then be applied to the cost that would otherwise be assigned casing-head gas under a strict energy-content allocation of the direct producing costs attributable to the leases involved.

Other modifications of the method used at Humble could probably be worked out to satisfy almost any condition.

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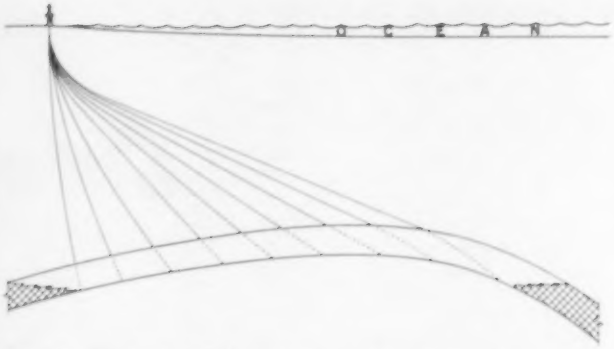


SLANT HOLES at Huntington Beach have been drilled as much as 73° off vertical. Photo shows the beach pumping installations; sketch indicates how the offshore structure is developed from land drilling sites.

What two companies have learned about drilling and producing those

High-Drift-Angle Directional Wells

During the past 4 years the authors' companies have been developing leases 1 to 2 miles offshore at Huntington Beach by directional drilling from offshore sites. They have drilled and completed 87 wells with drift angles over 60°. New tools and techniques have been called into play, as described here.

by Daniel S. Johnston and James T. Carriel

AN increasing number of oil wells are planned and drilled utilizing the techniques of controlled directional drilling to develop production from a desired subsurface location. During 1953, 20 per cent of all California wells were directionally drilled.

Huntington Beach, from the standpoint of directional drilling, is historically probably the most interesting oil field in the world. The development of the field spread rapidly after discovery in 1920 to an intensively drilled townlot area adjacent to the Pacific Ocean. In May 1930, one oil operator directionally drilled a well out under the ocean with neither permission to trespass under privately owned shoreland property nor rights to extract petroleum from state-controlled tidelands. Other operators followed suit, and an active drilling campaign ensued.

Authors are, respectively, general drilling superintendent, Signal Oil & Gas Co., and chief reservoir engineer, Southwest Exploration Co. Article is an abridged version of a paper presented at the Fourth World Petroleum Congress entitled "Techniques of Drilling and Producing High Drift Angle Directional Wells." Copyright 1955 by Carlo Colombo, Rome.

Glossary of Terms

Buildup: Portion of the hole wherein the drift has increased. Normally expressed in degrees per one hundred feet.

Deviation: Horizontal distance between two survey points or between the surface location and any point in the well.

Direction: Compass direction between any two survey points in a well.

Dog-leg: A sharp turn in a well course due to a change in drift, direction or both.

Drift: Angle of inclination off vertical.

Dropoff: Portion of the hole wherein the the drift has decreased.

Key seat: A groove of indeterminate length and depth worn into the wall of the hole; and shaped roughly to the outside diameter of the drill pipe tool joints.

Kickoff point: Subsurface depth where the well is started off of vertical. This is accomplished by use of a special directional tool.

Measured depth: Distance down the well bore from the kelly bushing or other reference point.

Vertical depth: Vertical distance between survey points or between the kelly bushing and any point in the well.

V. S. S.: Vertical depth below sea level.

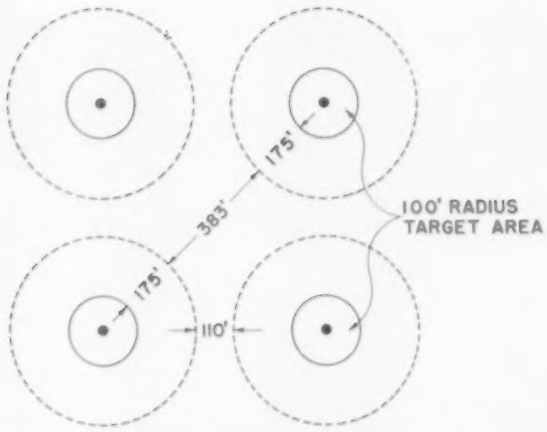
This practice was stopped by injunction in September 1933, and all operations were placed under the jurisdiction of the California Division of State Lands.

Signal Oil & Gas Co. and Southwest Exploration Co. have been actively engaged in directional drilling since 1934. A total of 462 directional wells, aggregating more than 500 miles of slant hole, have been completed by the two companies.

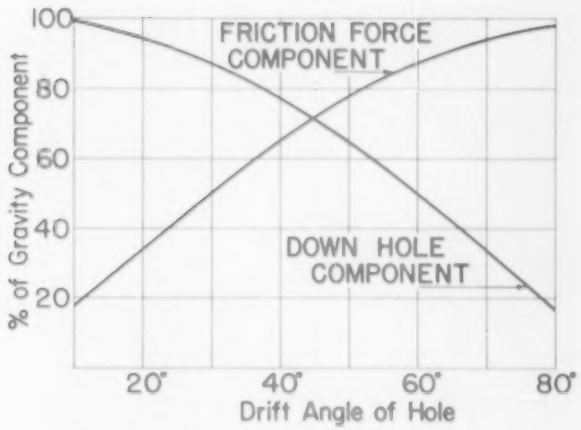
After 1938, these companies developed offshore Huntington Beach leases from the shoreland to 1 mile offshore. Then, in 1950 the two companies initiated development of two leases located 1 and 2 miles offshore from Huntington Beach by directional drilling from onshore drill sites. By August 1954 a total of 87 wells with high drift angles had been completed on these two leases (Fig. 1).

This paper is concerned primarily with the drilling, completing, and producing of these 87 wells.

Directional control . . . Generally, the



PLAN VIEW of 10-acre bottom-hole locations, showing possible spread of actual locations due to 1° survey error. Fig. 2.



PLOT of force diagram for various drift angles. Fig. 4.

Engineering at Midyear

tools and methods previously described in literature[1-6] are employed in controlling and surveying high-angle wells. The standard removable whipstock is the basic deflecting tool used, and surveying is accomplished by photographing a single-shot-type compass and inclinometer seated in nonmagnetic K-monel drill collars.[6] Drift angle is increased or decreased as desired by application of the principles of leverage and choice of drilling tools.[2-4]

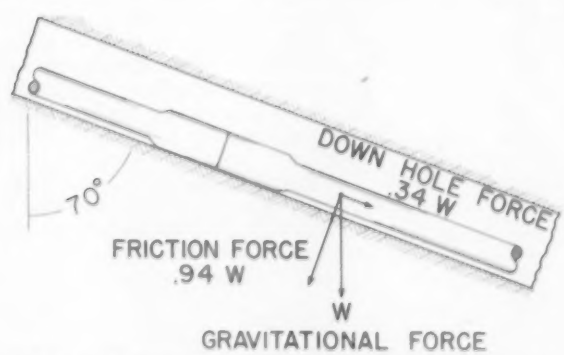
Control of direction angle in a high-drift-angle hole is one of the major problems. The removable whipstock is still the basic tool of control, and with it the operator must accept the increased hazard of a fishing job. Direction angle change in the offshore pool at Huntington Beach, however, can definitely be influenced by different designs and combinations of drilling bits and reamers.

Although not representing complete direction angle control, variations of bit and reamer designs and combinations do eliminate some whipstock runs. Such variations should be of definite value in other oil fields. Most high-drift-angle holes have a tendency to drift to the left or right rather than follow a straight line course in direction. Huntington Beach wells in most cases exhibit left-hand tendency. By constructing a proposed course that allows for this drifting tendency, many whipstock runs can be avoided. Any cylinder restriction around the proposed course should be as flexible as possible. This also can eliminate some whipstock runs. Other methods of control are being studied. Alternate left-hand and right-hand rotation of the drill string shows much promise. A locked drill-pipe tool joint essential to alternate rotation has been designed and tested in the field.

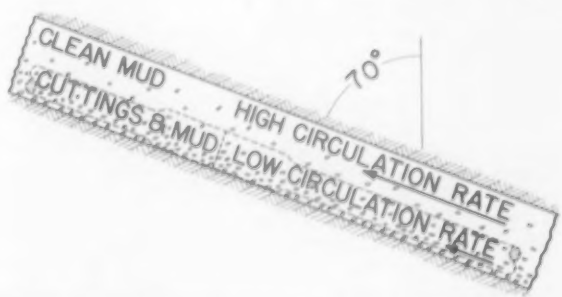
Problems in surveying, not critical in low-angle directional wells, have to be overcome in high-drift-angle holes. The surveying instrument on a sandline will not drop to bottom and must be pumped down using a stuffing-box and swivel arrangement. To minimize wear on instruments pumped down, internal flush drill pipe is recommended. Although the pipe is rotated during running and pulling the single-shot instrument, the hazard of sticking the drill pipe during surveying is ever present. Also the accuracy of surveying a high-angle directional well with a small compass is debatable. Fig. 2 illustrates the effect of 1° continuous error in measured direction in a well drifted 10,000 ft. offshore. The 175-ft. total error can make an appreciable difference in actual well spacing in a 10-acre pattern. Drift-angle error also can be cumulative in the same magnitude. Instruments are changed at regular intervals to reduce the probability of cumulative error in one direction. Development of a surveying method which eliminates the use of a small compass and which eliminates the time consuming and hazardous operation of pumping down and retrieving the instrument will be a most valuable contribution to the art of high angle drilling.

Mechanical problems . . . Two basic conditions in high-drift-angle holes create major problems which are generally minor or nonexistent in straight holes:

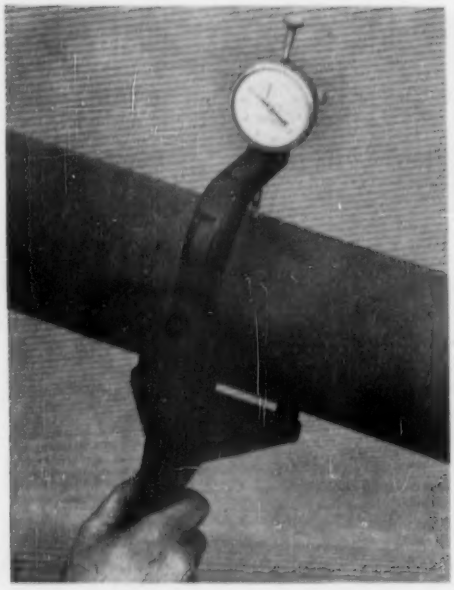
1. Only a small portion of the weight of the drill string is available for moving the tools down the hole. Over 90 per cent of the weight of the drill



FORCE DIAGRAM in 70° angle well. Notice that only ⅓ of the weight of the drill string is effective in drilling ahead. Fig. 3.



CIRCULATION DISTRIBUTION in 70° angle well. Cuttings collect on the low side of the hole. Fig. 5.



DRILL PIPE is gaged with a micrometer after every slant hole to eliminate failures. Fig. 6.

REINFORCING BANDS are welded on the surface casing. Fig. 7.

Engineering at Midyear

string is bearing on the low side of the hole as a friction force component (Figs. 3 and 4).

2. Circulation in high-angle holes is similar to flow along a stream bed. Cuttings are washed along the low side of the hole at slower than the average circulation rate; and clean mud channels on the high side of the hole at faster than average circulation rate (Fig 5).

From these two conditions stem a multitude of problems which had to be resolved for successful high-drift-angle drilling.

Key seats . . . Drill pipe rotating with almost its full weight bearing on the low side of the hole soon wears key seats in the soft formations. These key seats are worn to the size of the drill-pipe tool joints.

For this reason the diameter of the tools run in the hole becomes critical. For instance, drill collars should have outside diameters the same as, or smaller than, the drill-pipe tool joints, or considerably larger. Drill collars with the same or smaller diameter will follow through key seats. However, due to greater stiffness in drill collars than in the drill-pipe tubes, some sticking hazard is present. Drill collars slightly larger than tool joints will partially lodge in key seats and often stick. Drill collars considerably larger in diameter will ride over key seats and minimize sticking hazard.

Skillful drillers can avoid pulling into key seats most of the time. One of our larger power rigs transmits all power to the draw works and pumps through dynamatic couplings. Horsepower input to the hoist, rotary table, and pumps can be smoothly regulated from zero to maximum. In pulling drill pipe, only sufficient horsepower is transmitted to move the pipe. Any increase in load requirements due to key-seat friction will instantly stall the drill pipe without pulling into the key seat. This type of coupling has proved to be of great value and aid to the driller. Steam rigs have similar characteristics to those mentioned above and are preferred over power rigs not equipped with a dynamatic or other "cushion" type drive.

A bumper sub is carried immediately above the drill collars and sometimes others are placed at selected intervals up the string of drill pipe. Usually the tools can be bumped downward out of a key seat. If not, conventional fishing methods will apply if the position of the fish on the low side of the hole is taken into account. In case of unrecovered fish, sidetracking by undercutting is normally accomplished by repeated reaming and drilling above the fish. As the old hole is undercut, a new hole is started.

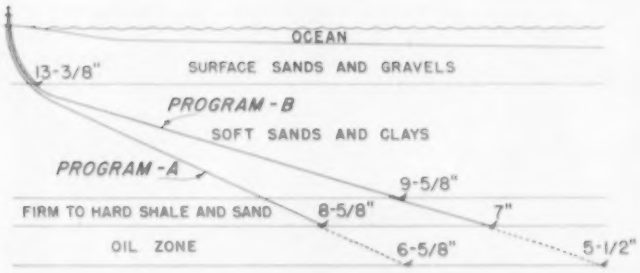
Torque . . . As the weight of the drill string is mostly on the low side of the hole creating friction, rotation torque is greatly increased. This places a severe torsional strain on the drill pipe and also makes difficult the transmission of a known amount of turn to the bottom of the drill string. At least 400 delivered horsepower should be available to the rotary table in high drift angle wells for peak loads. By taking out only the horsepower needed for actual rotation through the dynamatic couplings, drill-pipe twistoffs have been minimized by elimination of sudden loading.

A program of periodically reaming the hole helps to smooth out the key seats. Tight spots are also reamed with the drilling tools when running in the hole. High-angle directional holes must be kept in better condition than straight holes.

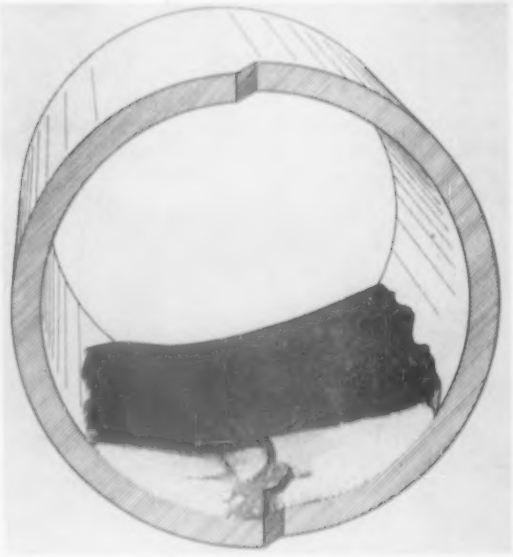
Clean hole necessary . . . The problem of key seats and tight hole might not be severe if it were possible to keep the hole and drilling tools clean. Under the circulation conditions described, however, cuttings are not efficiently removed and partially settle along the low side of the hole. When pulling out of the hole, some of the cuttings will be pushed ahead of the bit and reamer, eventually balling up and sticking the tools. This condition is aggravated if the tools are already partially balled up from digging in sticky shale.

As an aid in keeping the hole clean, the following practices have been adopted:

1. High circulation rates are maintained. Experience indicates that a velocity of 2 ft. per second in the annulus may be minimum requirements. Two-feet per second rate in 12¼-in. hole with 4½-in. internal flush drill pipe at 7,000 ft. will return 600 g.p.m. and require 500 hydraulic horsepower under average conditions. Hydraulic requirements should be a



TWO DIFFERENT casing programs are used, depending upon hole conditions. Fig. 8.



CEMENT may channel on the low side of the hole. This shows cement that collected on the low side of the drill pipe. Fig. 10.

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foremost consideration in any high angle directional drilling-rig design.

2. When pulling out of the hole, circulation is established at several depths to circulate the cuttings up the hole in stages.

3. The properties of the high-pH oil-emulsion mud are carefully controlled to maintain maximum carrying and suspending properties. A relatively high oil content (up to 20 per cent) is used to provide lubrication and low-water-loss characteristics.

Condition of drill string . . . Drill-pipe wear is another major problem resulting from rotation under great friction without adequate circulation. As the pipe rotates in a medium of abrasive sand cuttings with 90 per cent of its weight supported by the mostly abrasive wall of the hole, tool joints and tubes receive rapid and extreme wear. Unless drill string is maintained in first-class condition, failures due to twistoffs in thin tubes are frequent. Consequently, a program of regular inspection and repair is established routine. After every well each joint is checked for tube wear using a micrometer (Fig. 6). Tubes showing more than 18½ per cent reduction in wall thickness are retired from open-hole directional drilling.

Unprotected tool joints can wear beyond repair during the drilling of a single well. After testing many metal compounds and application methods for tool joint protection, our companies standardized on tungsten carbide applied by company welders using acetylene. This type of hard-facing band was found to be outstanding in all respects. Also fingers of tungsten carbide are laid in grooves along the 18° taper at right angles to the band.

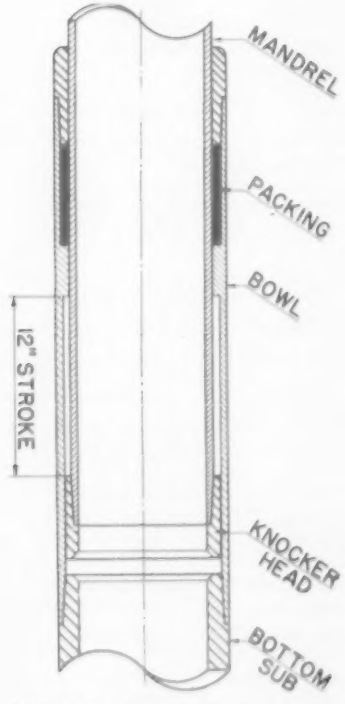
Maintenance of tool joints at maximum diameters by regular rehardfacing virtually eliminates tube wear. Other methods of drill pipe tube protection used are:

1. The unprotected tool joint is allowed to wear to a minimum diameter and then is replaced with a new tool joint.

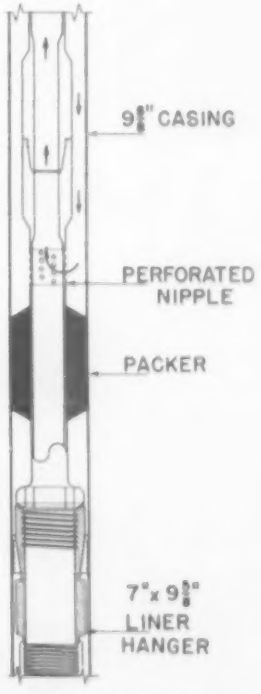
2. Wear subs are inserted between the pin and box of the tool joint. Upon wearing to a minimum diameter, they are replaced or resleeved.

The drill pipe is also inspected for shoulder wear on the box with a minimum gage for damaged threads and for tube straightness. A crooked tube of drill pipe can be worn out by one trip in the hole and during the dulling of one bit.

Surface pipe protection . . . A 13⅜-in. casing is cemented in the curved portion of the hole and consequently is subjected to considerable wear from the drill pipe. Although drill-pipe rubber protectors are used, the casing shoe and bottom few joints are in contact with drill pipe steel during rotation. Also in round tripping, the hard-faced tool joints move through the casing usually along the same path.



USUALLY three casing bumper subs similar to the design above are used in the casing string. Fig. 9.



PACKER SETUP for changing to oil above a low-pressure zone. Fig. 11.

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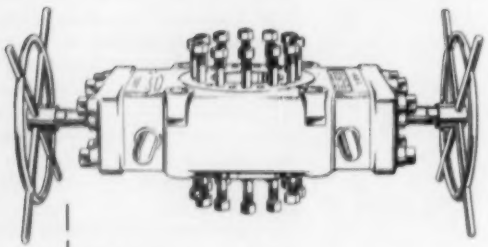

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The use of a special casing shoe was adopted after regular shoes were worn through on two wells. This shoe is extra long and has a wall thickness of 1¼ in. None of these special shoes has worn through, but in one instance the shoe joint was worn through while the shoe remained intact. Subsequent practice has been to weld 2-in. steel bands 2 ft. apart along the entire length of the bottom two casing joints (Fig. 7).

Hard-faced drill pipe is never used in the surface casing. Oversize twin pin wear subs are used in the connecting drill string between the rubbered drill string in the casing and the hard-faced drill string in the open hole. These wear subs must be resleeved to maximum outside diameter with regular tool joint steel at frequent intervals. Drill-pipe rubber protectors are shifted after each well to eliminate failure of the tube by flexure and mud abrasion at the rubber metal contact.

Early experience at Huntington Beach indicated that serious hole trouble is apt to develop after about 30 days of open-hole drilling below the surface casing.

The soft clays and sands tend to disintegrate and cave after continued exposure to drilling fluid. Key seating becomes critical. As circulation rates decrease with depth, the key seats become partially filled with cutting. These cuttings may pile up ahead of the drilling tools while pulling out of the hole, causing stuck drill pipe.

As a result, a casing program was designed to limit the length of open hole carried to 7,100 ft. the footage usually drilled in about 30 days. In wells for which 8,300-ft. total depth is sufficient to shut off all water above the oil zone, Program "A", Fig. 8 is followed. If water zones are still open above the oil zone, Program "B" is followed. Table I shows details of design for each of the casing programs.

As shown earlier in Fig. 3, only one-third of the casing weight is effective for moving down the hole, while over 90 per cent of the casing weight is bearing on the low side of the hole. Certain considerations in casing design and running procedure were, therefore, necessary.

Running casing . . . Water strings and protection strings have been the most difficult to run in the hole; primarily due to the fact that from 8 to 16 hours are required to make up the casing and reach total depth. During the last 2,000 to 4,000 ft., the string must be picked up and released several times after each joint makeup, before the casing will move down the hole. Quick-release thread protectors and air tongs are used to speed up the operation. The pipe is filled on each joint to minimize buoyancy. Two methods have been developed to combat static friction between casing and hole. One casing centralizer is installed on every other joint for the bottom 50 joints to reduce static friction. A series of internal flush bumper subs in the casing string are used as an aid in breaking static friction after joint makeup (Fig. 9). Normally three of these bumper subs are included in the string.

Running 7-in. blank liners in 8¾ in., high-drift-angle hole is done only

TABLE I—CASING PROGRAM "A"

Type	Size in.	Weight lb./ft.	Grade	Max. Depth (Current Practice)
Surface pipe	13⅜	54.5	J-55	1,200
Water string	8⅝	32	J-55	8,300
Production liner	6⅝	24	J-55	10,000

CASING PROGRAM "B"

Type	Size in.	Weight lb./ft.	Grade	Max. Depth (Current Practice)
Surface pipe	13⅜	54.5	J-55	1,200
Protection string	9⅝	36	J-55	8,300
Blank liner	7	23	J-55	10,100
Production liner	5½	15.5	J-55	11,000

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with great difficulty, unless provision is made for fluid passage inside as well as outside of the casing. Without sufficient fluid passage, the liner acts as a piston in close-tolerance hole. The advantages of running the cementing tool at the same time as the 7-in. blank liner were also apparent. To satisfy both of these requirements, a special liner hanger was designed. Use of this hanger, in conjunction with a special float collar, results in adequate fluid passage around and through the liner. It also allows immediate cementing after the liner reaches bottom and the hanger is set.

Perforated liners have not been difficult to run with a single exception. One did not reach bottom due to a severe lost circulation problem. Five-and-one-half-inch flush joint liner is run in 6¼-in. hole and 6⅝-in. liner with 7-in. o.d. couplings is run in 7⅝-in. hole.

Cementing . . . In high-drift-angle directional wells, cementing operations are similar to those in vertical holes provided one factor is taken into consideration: mud will channel on the high side of the hole bypassing cement, and conversely; cement will channel on the low side of the hole bypassing mud. Fig. 10 illustrates a half moon of cement which remained on the low side of 4½-in. drill pipe used for cementing after many barrels of mud had been pumped by it. This particular half moon occupied 500 ft. in the drill pipe and had been built up over a period of several successive cement jobs.

Surface casing, water strings, and protection strings can be cemented in a conventional manner with the following precautions:

1. Large volumes of cement are used (600 to 800 sacks) to reinforce the casing for subsequent drilling and producing operations and to reduce the channeling effect near the shoe.
2. An 85-lb. per cu. ft. slurry is used for water strings and protection strings to reduce channeling and to decrease the hydrostatic pressure on the formation. Expanded perlite is used as the lightweight additive.

Liners . . . Blank liners have presented more cementing problems. A successful job consists of displacing cement from the shoe to the top of the blank liner (2,000± ft.) in a manner which results in a cement seal between the protection string and the overlap of the liner. The channeling tendency between cement and mud resulted in four failures on the primary cementing of our first five jobs. Subsequent jobs have all been successful due to adoption of the following practices:

1. Lightweight cement, as near the density of drilling fluid as practical, is now used.
2. Overlap between 9⅝ and 7-in. casing string was lengthened to 400 ft. from 200 ft.
3. The size and number of centering lugs which are welded at regular intervals around that portion of the 7-in. blank liner inside of the 9⅝-in. casing were increased. Five 6-in. lengths of ¾-in. sucker rods are now spaced equidistant around each joint of 7-in. in the overlap.
4. Cementing can take place immediately after the liner is hung.

Plugging bottom . . . Conventional methods of plugging bottom water are not effective in high-drift-angle holes. Sufficient volumes of cement cannot be used in plugging to successfully eliminate gravity channeling.

Present practice for bottom water plugs involves the use of an upwhirler cementing shoe on the bottom of blank drill pipe. The shoe is raised slowly during displacement of the cement. Gel is added to the cement to decrease shrinkage.

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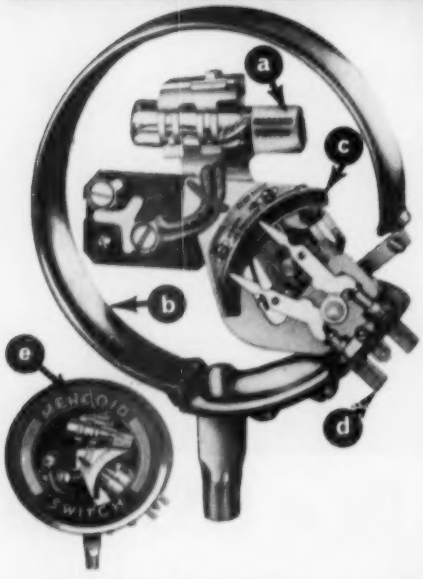

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Testing for water shutoff . . . Wherever the effectiveness of a cement job must be insured, a water-shutoff test is made. Tests for water shutoff are ordinarily made with a casing slip-type tester. However, this tool proved troublesome in high-drift-angle holes primarily because of rotation to set the slips and open the trip valve. A known amount of turn cannot be transmitted effectively from the surface through flexible drill pipe to the tool. Often the slips strip off of the tool or will not set. Two severe fishing jobs resulted from using this type of tool and 9 out of 38 jobs were misruns.

An open-hole-type tester, run without a trip valve, can be set and opened by placing the drill string weight on bottom. Only 4 out of 32 jobs have been misruns with this type and no fishing jobs have resulted.

Completion problems . . . Loss of circulation in varying degrees is common in the Huntington Beach offshore pool. Some wells are drilled with full circulation, some will support an oil column without appreciable loss but will take mud, and others are drilled with oil without returns.

If circulation loss is severe enough for the cuttings to disappear completely into the zone, no problem of well cleanup for production exists. However, later in the life of the well, these cuttings may cause producing problems. The wells with partial lost circulation present the major problem. In this case the cuttings will neither disappear into the zone nor circulate out with the reduced velocity of partial returns. Present practice is to drill ahead with oil, if circulation is lost, leaving the remaining mud column as a mud cap. If partial returns are obtained as drilling progresses, the volume of the mud cap steadily diminishes as the oil channels through it. In any event, cuttings will remain in the well, and are usually found strung out over almost the full length of the hole. Cutting concentrations are found at increases in hole or casing diameter. If the well is placed on the pump without cleanup, these cuttings will gradually work to bottom as the fluid level drops. Stuck pumps and sometimes stuck tubing result.

The following cleanup program has been used with satisfactory results:

1. An open-hole packer on the end of drill pipe is set at the top of the liner with a perforated sub above the packer. Below the packer a blank sub is used with the end designed to seat on top of the liner hangar. The entire hole above the liner can then be cleaned by reverse-circulating any de-

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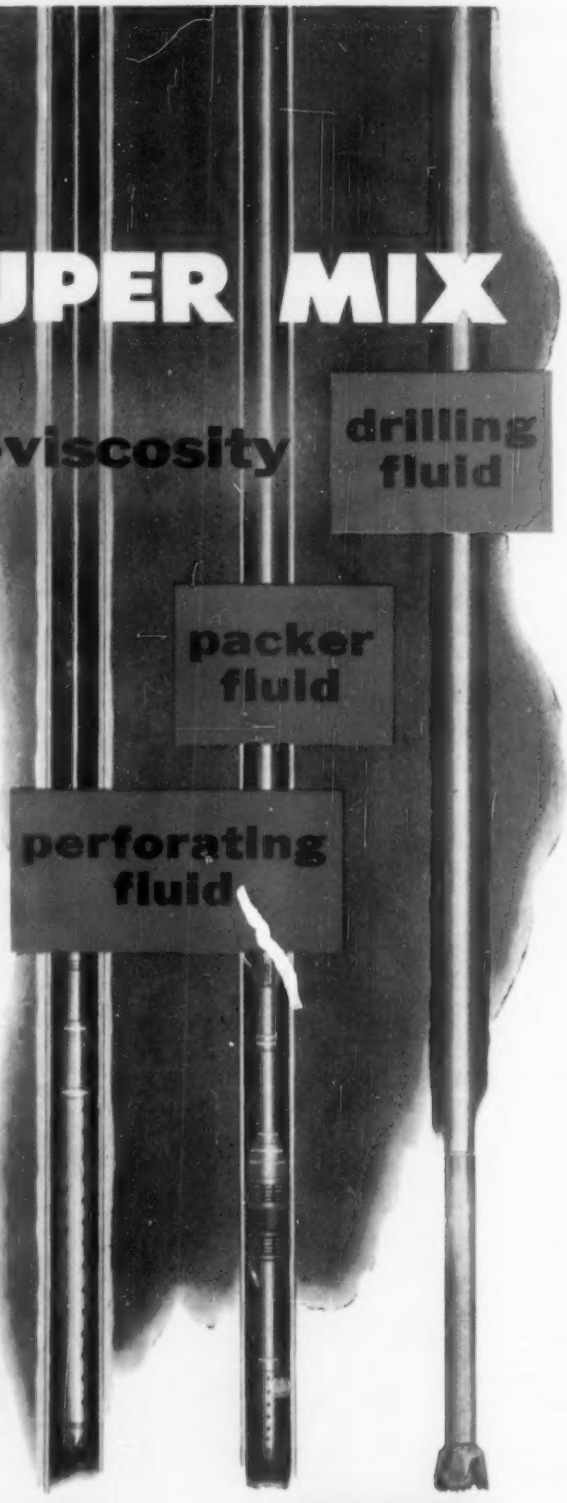

Here is a new, low-viscosity oil base drilling fluid that can be weighted to extremely high weights, yet remains stable under high temperatures and pressures. Tests have been run for periods of four weeks under high pressures and at temperatures up to 400° F. with no adverse effects. It contains no clays or bentonites; problems of high temperature gelation are completely eliminated.

DRILLING AND COMPLETION FLUID

Due to its low maintenance cost and complete resistance to contamination from cement, salt, anhydrite, etc., Super Mix is the ideal fluid for drilling and completion work where high mud weights are required. During a recent workover job in the Gulf Coast Area, Super Mix was weighted to 17.0 lbs./gal. (127.5 lbs./cu. ft.) with a viscosity of 69 sec. API at 120° F. This mud was in use for six weeks and *the total treating cost was less than $300.00.* Weights as high as 18.7 lbs./gal. (141 lbs./cu. ft.) have been successfully used in the field. For drilling deep, hot holes, heaving shale, and other troublesome formations there is no fluid to equal Black Magic Super Mix.

PACKER FLUID

Super Mix is also being used extensively as a highly weighted fluid in the annulus above production packers in high pressure wells. In no case has the fluid shown any tendency to settle, disintegrate or solidify. When it becomes necessary to pull the packer, the Super Mix — unlike other packer fluids — serves as an ideal drilling or workover fluid. It can not deteriorate by standing idle for long periods of time.

PERFORATING FLUID

As a perforating fluid, Super Mix will not seal off the newly shot holes, as is the case when a fresh or salt water clay mud is used. The excessive heat and force generated by bullets and jet charges actually bakes a hard, solid clay plug behind the shot, thereby minimizing the perforating job. In some cases flow has been restricted as much as 77 %.* In recent experiments with perforating guns, Super Mix produced a soft mushy substance in shot holes which dissolved in crude oil when the well came on production. *No possible chance of plugging the formation with this drilling mud.* For more information on Super Mix, write for the paper—"Recent Developments in Oil Base Mud."

*Effectiveness of Gun Perforating, Journ. Pet. Technology, January, 1954.

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sired volume and velocity of oil. No back pressure is placed on the oil zone (Fig. 11).

2. After the casing is filled with clean oil, circulation can often be established. In this case, blank drill pipe is run and the liner is cleaned up in 500-ft. stages by reverse circulation. If circulation cannot be reestablished, the cuttings are driven down to the lost-circulation zone by forcing oil away.

3. The well is then bailed until clean, using a bailer on the end of the drill pipe or tubing.

Acknowledgment

Grateful acknowledgment is made to numerous Signal and Southwest personnel in various departments such as service, purchasing, industrial relations, gas, engineering, and operating for their help in development of the techniques described herein and their assistance in preparation of this paper. The authors wish to thank R. H. Green for the inception of and permission to publish this report.

Bibliography

1. H. John Eastman: The Latest Developments and Achievements of Directional Drilling in the Exploration of Oil Fields; Third World Petroleum Congress, The Hague, 1951.

2. D. K. Weaver: Practical Aspects of Directional Drilling, A. P. I. Drilling and Production Practice, 1946.

3. D. L. Roberts: Directional Drilling in the Los Angeles Basin, A. P. I. Drilling and Production Practice, 1949.

4. F. A. Graser: The Fundamental Mechanics of Directional Drilling, A. P. I. Drilling and Production Practice, 1949.

5. H. John Eastman: Oil Well Surveying, Equipment, Procedure and Application of Directional Oil Well Surveying, Int. Oil, (Apr.) (1940).

6. Raymond I. Mahan: "K" Monel Nonmagnetic Drill Collars for Oil-well Surveying, A. P. I. Drilling and Production Practice, 1951.

7. Preston W. Hill and Frank E. Davie: Corrosion Treatment of Pumping Wells in California, A. P. I.

8. H. John Eastman: Producing Directionally Drilled Wells: Petroleum Eng. (July) (1953).

9. Gordon Jackson: A Report of Penetration Rates for Directional Drilling Operations; A.I.M.E., October 4-5-6, New Orleans, 1950.

10. J. Zaba: Some General Aspects of Controlled Directional Drilling, Petroleo Interamericano, March-Apr. (1945).

11. G. L. Kothny: Controlled Directional Drilling of Wells, Oil Weekly, Jan. 20 (1947).

12. Byron Wiess, Jr.: Application of Magnetic Method of Deflecting-Tool Orientation, The Oil and Gas Journal, June 25 (1942).

13. Gilbert Wilson: Free Pumps, Speeds, Surfacing and Seating, World Oil, July 28 (1947).

14. Richard Sneddon: Free Pumping Introduces New Production Practices, Petroleum Eng. (July) (1950).

15. Gordon Jackson: Directional Drilling Today, Petroleum Tech. (June) (1951).

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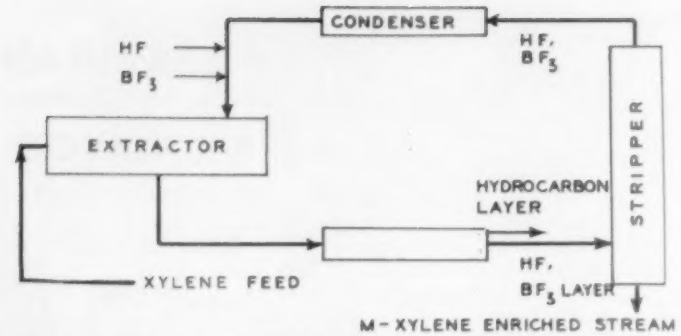
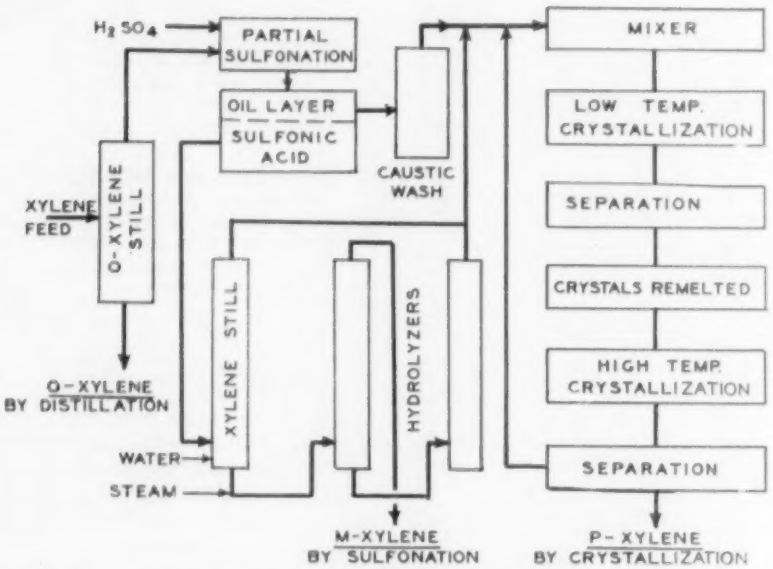
PETROLEUM XYLENES . . .

Their Separation and Oxidation

Increased use of p-xylene for Dacron and construction of an isophthalic acid plant directs attention to these petroleum-derived isomers.



RECOVERY of m-xylene from a mixture of xylenes usually makes use of the higher reactivity of m-xylene. This schematic diagram shows one method using HF-BF_3. Fig. 1.



SEPARATION of xylenes is shown here in which o-xylene is recovered by superfractionation, while the meta and para isomers are selectively sulfonated and the p-xylene removed by fractional crystallization. Fig. 2.

SINCE World War II, the gradual trend toward higher xylene production has resulted in part from the use of pure isomers as aromatic chemical building blocks.

- Most of this additional xylene has come from petroleum, from which it was first produced in commercial quantities in 1941. By 1951, about 85 per cent of the xylene produced during that year came from petroleum sources, the remainder being supplied by coke-oven operators and tar distillers.
- Of all xylenes separated into isomers in 1951, phthalic anhydride and terephthalic acid probably utilized about 90 per cent.
- Phthalic acid, as its anhydride, became an article of commerce about 1916, and its growth has been rapid and steady. Terephthalic acid, the para isomer, while a relative newcomer, is rapidly becoming a major organic chemical in the fiber and film field.

Condensation from Fourth World Petroleum Congress paper "The Recovery and Oxidation of Isomeric Xylenes," by W. G. Toland and E. L. Nimer of the California Research Corp., Richmond, Calif. Paper presented at Rome, June, 1955. Copyright 1955, by Carlo Colombo, Rome.

Recently announced plans for commercialization of isophthalic acid, the meta isomer, completes the picture, with products expected to invade the surface coatings and reinforced-plastics fields.

- As an example in the petroleum field, orthoxylene was separated by Oronite Chemical Co. on a commercial scale in 1945 and used by it for making phthalic anhydride.

P-xylene . . . The first commercial process to isolate relatively pure p-xylene from petroleum raw materials was put into operation by Oronite Chemical Co. in 1951. The production of this xylene isomer for use in making terephthalic acid, an ingredient of polyester polymers known in fiber form as Dacron and Terylene and in film form as Mylar, has skyrocketed from 8 million pounds per year in 1952 to an estimated total plant capacity of over 70 million pounds per year by early 1955. (Figure for 1955 has been updated by editor and changed from original.)

Ed. note: It is estimated 32,000,000 lb. of this total is produced by Standard Oil Co. of California (Oronite), 25,000,000 by Humble Oil & Refining Co., 5,000,000 by Phillips Chemical Co., and 10,000,000 by Sinclair Chemical Co.

Construction of a plant for making m-xylene with an estimated capacity of 50 million pounds per year was announced recently by Standard Oil Co. of California. Most of the purified m-xylene is to be used to manufacture isophthalic acid.

Xylenes from petroleum . . . Mixtures of xylenes from petroleum suitable for the recovery of xylene isomers are usually made by catalytic reforming processes which convert selected naph-

thenes or paraffinic hydrocarbons or both to aromatic compounds.

Separation of Xylene Isomers

The many methods and processes that have been devised for the separation and recovery of the xylene isomers are based either on differences in physical properties between the pure xylene isomers or employ the selectivity of one of more of the isomers toward formation of molecular complexes or chemical compounds. Commercially, both o- and p-xylenes are separated from mixtures of C_8 aromatics by differences in their physical properties.

The boiling point of o-xylene is higher than that of the other isomers and it is separated as the residue in the distillation of a mixture of the xylene isomers. P-xylene has a higher melting point than the others and is separated by crystallization. The recovery of m-xylene usually involves its greater chemical reactivity in forming complexes or chemical compounds with other compounds.

Fractional crystallization . . . Differences in melting points (Table 1) are sufficiently large to make feasible the separation of p-xylene by crystallization from a mixture of these compounds. However, the formation of a p-xylene-m-xylene eutectic mixture of about 12 per cent p-xylene and 88 per cent m-xylene complicates the situation. Nevertheless, several commercial processes for the recovery of p-xylene in this way are in operation. Most of these employ fractional crystallization in one or more stages where part of the p-xylene is crystallized from the xylene mixture to give a high purity paraxylene.[2,3,4,5] Some methods freeze out impure p-xylene and purify it by fractional melting or partial melting and recrystallization from the slurry thereby formed.[6,7,8]

Several processes recover p-xylene by crystallizing it from a xylene feed to which another component has been added. The presence of this suitably chosen component usually lowers the crystallization temperature and effects greater recovery of p-xylene from the xylene mixture. Compounds that have been used in this way are methanol and ethanol,[8] isopentane, ethane, ethylene, etc.[9]

Fractional crystallization processes have been developed to recover m- or o-xylenes or both in addition to p-xylene. In general the o-, m-, and p-xylene are crystallized separately with or without diluents in the order of their decreasing melting points.[4,10,11]

Isomerization . . . Recovery of p-xylene from a given xylene mixture can be greatly enhanced by including a xylene isomerization step along with fractional recrystallization.[12]

Cocrystallization . . . One process overcomes the limitation of the 12 per cent p-xylene-m-xylene eutectic mixture in the fractional crystallization of p-xylene[13] by the addition of a tetrahalogenated methane, such as carbon tetrachloride or carbon tetrabromide, to the xylene mixture, followed by formation of crystals by freezing to precipitate the p-xylene as a cocrystal-

TABLE 1—PHYSICAL PROPERTIES OF XYLENE ISOMERS[1]

Compound	Melting point, °C.	Boiling point, °C.	Density at 20° C. g/ml	*Heat of combustion at 25°C. $-\Delta H^\circ_c$ (kcal./mol.)
Ortho-xylene	—25.182	144.411	0.88020	1088.16
Meta-xylene	—47.872	139.103	0.86417	1087.92
Paraxylene	13.263	138.351	0.86105	1088.16
Ethyl-benzene	—94.975	137.186	0.86702	1091.03

* C_8H_{10} (liq.) + 10.5 O_2 (gas) → 8 CO_2 (gas) + 5 H_2O (liq.)

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TOP — Shown here are reliable GMV hydrogen compressors in Sun Oil Company's Marcus Hook petrochemical plant. Compressor cylinders, on opposite side of safety wall, are not visible in this view.

LEFT — Line-up of 6-cylinder Cooper-Bessemer GMV's in Sun Oil's aromatic recovery plant. Each of these compressors is rated 660 hp at 300 rpm.

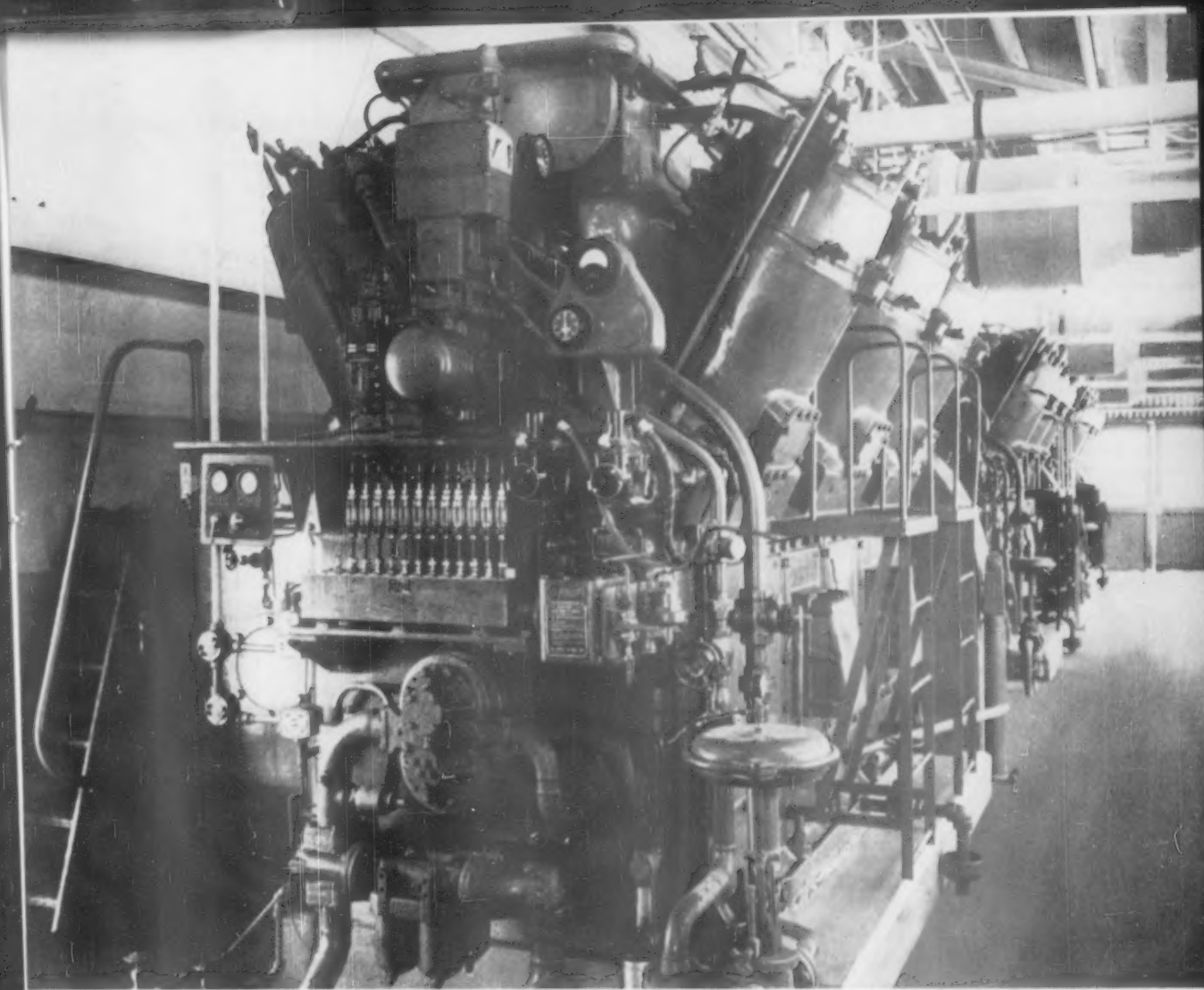
RIGHT — In this view of the Marcus Hook Refinery hydrogen gas compressor house, you can see one of the four Cooper-Bessemer units housed inside.

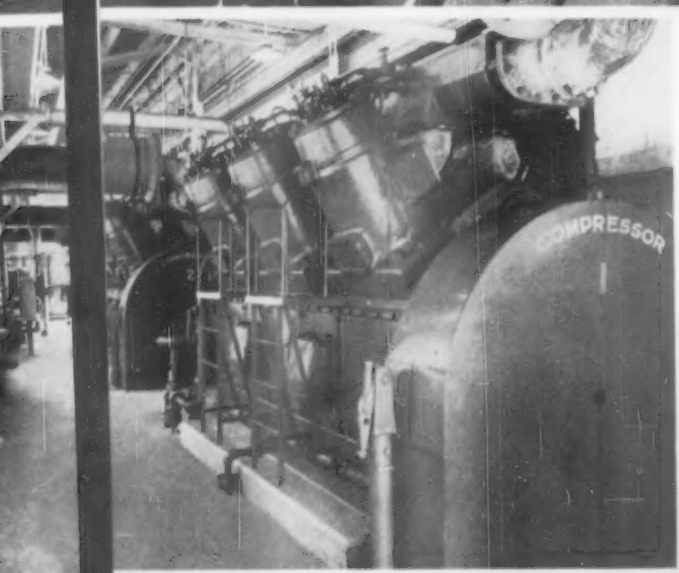
ANGLE

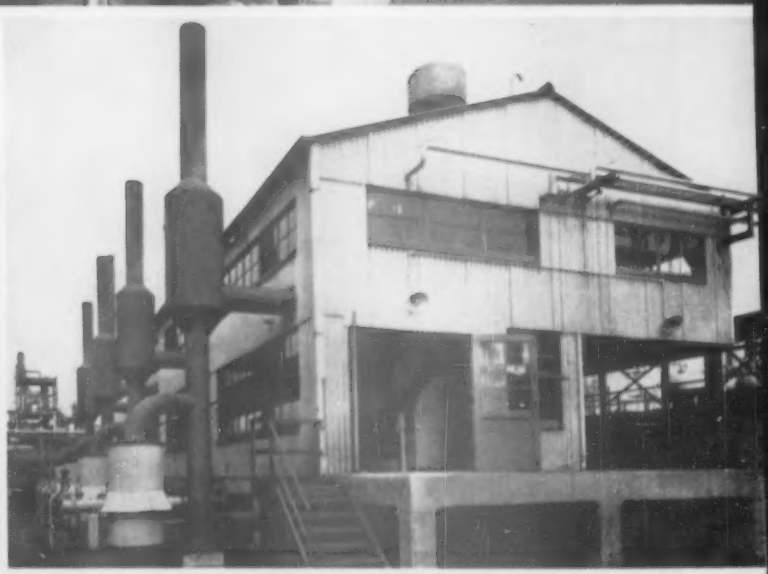
Compressors

New York Washington, D. C. Bradford, Pa.

San Francisco, Cal. Houston, Dallas, Greggton, Pampa and Odessa, Texas Seattle, Wash.







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lized solid with the halogenated methane. Formation of this cocrystallized solid alters the normal eutectic composition of the feed and is limited by formation of a ternary eutectic of tetrahalogenated methane, p-xylene, and m-xylene containing only 1 per cent p-xylene.

The pure p-xylene is obtained from the cocrystallization product by distillation of the tetrahalogen methane. This method makes possible substantially complete separation and recovery of paraxylene from a feed stock containing p-xylene or xylene isomers or both.

M-xylene . . . Methods of recovering m-xylene from xylene mixtures generally take advantage of differences between the reactivity of this isomer and the others. One group of processes[14 15 16 17] is based on the ability of m-xylene to form complexes with $HF\text{-}BF_3$ which are soluble in excess HF. The relative stabilities of BF_3-HF-xylene complexes of m-, o-, and p-xylene are 20:2:1, thus showing the complex to be extremely sensitive to differences in structure between the xylenes, and particularly useful for the separation of m-xylene from o- and/or p-xylene.

A schematic diagram of a process for the enrichment of m-xylene in a mixture of xylenes using $HF\text{-}BF_3$ is shown in Fig. 1. M-xylene is separated from its isomers by intimately contacting the xylene mixture with an $HF\text{-}BF_3$ extractant for sufficient time to allow the m-xylene complex to form and dissolve in the acid phase. The mixture is then allowed to settle and separate into an organic and an acid phase. The m-xylene is recovered from the acid phase by reduction of pressure and evaporation of the BF_3 by heating to decompose the complex or by stripping the acid phase with inert gases, such as paraffins, nitrogen, carbon dioxide, etc.[14]

M-xylene of 95 per cent or greater purity was produced using a four-stage extraction process of this type. Ethylbenzene disproportionates in the presence of the $HF\text{-}BF_3$ solutions and, therefore, can be removed from the other C_8H_{10} isomers by this process.

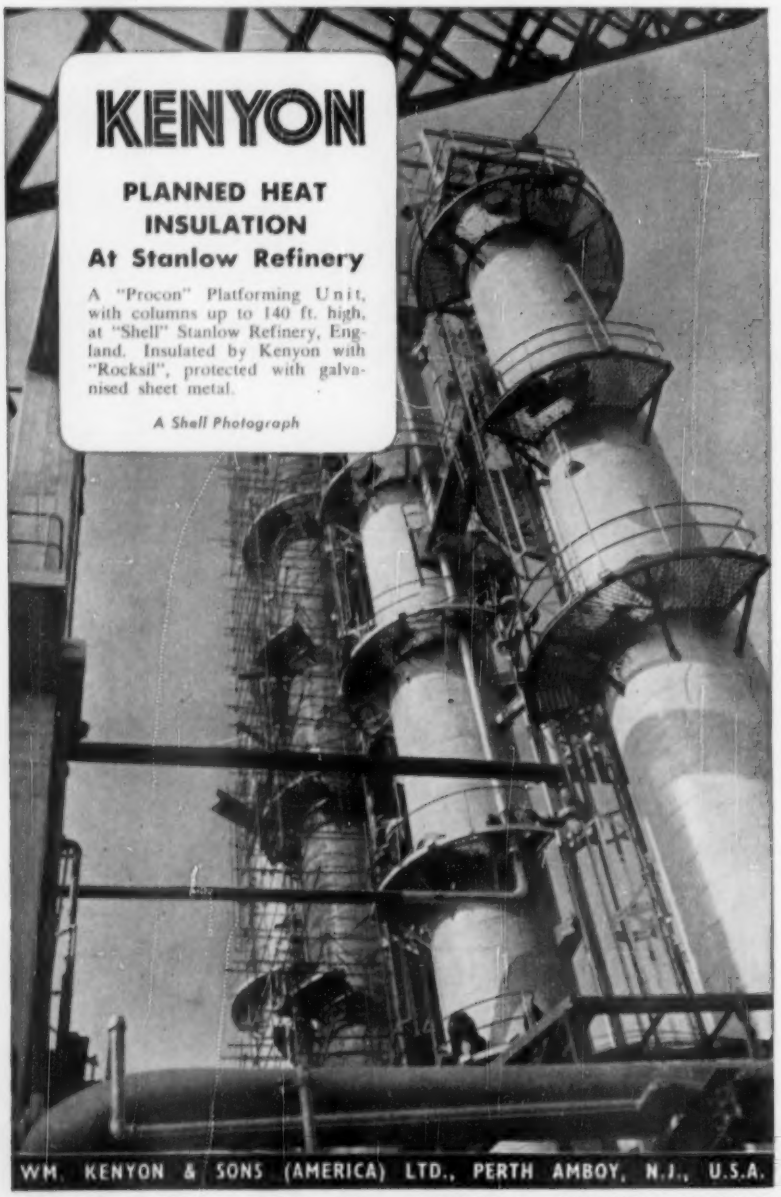
M-xylene can be reacted with mercuric salts to form organometallic compounds.[18] M-xylene can be separated from an isomeric mixture of xylenes by selective sulfonation.[17] Many processes have been described. Most of them partially sulfonate the xylene mix with concentrated H_2SO_4, separate the m-xylene sulfonic acid-sulfuric acid layer from the unsulfonated xylenes, and recover the m-xylene by selective hydrolysis of the sulfonic acid by steam distillating the m-xylene from the H_2SO_4-m-xylene-sulfonic acid mixture. Mixtures of xylenes have been separated and recovered as individual fractions of o-oxylene, m-xylene, and p-xylene, each of at least 90 per cent purity, as shown in Fig. 2, by superfractionating to recover the o-xylene, selectively sulfonating and hydrolyzing the m- and p-xylenes, collecting the m-xylene fraction and the enriched p-xylene fractions, and fractionally crystallizing p-xylene from the latter mixture.[19]

Another reaction that has been used to separate xylene isomers is that of the xylenes with saturated aldehydes of at least two carbon atoms to form dixylyl aliphatic compounds.[20]

Alkylation of a mixture of xylene isomers with certain alkylating agents having tertiary carbon atoms can be made to react selectively with o- and m-xylene.[21 22]

Oxidation of the Xylenes

The oxidation of the xylenes can be made to yield several types of intermediate oxidation products, depending upon the conditions and oxidizing agent used. Included among the products are acids, anhydrides, aldehydes,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alcohols, peroxides, esters, and ketones. Carboxylic acids are the only group of compounds produced in good yields by direct oxidation of the xylenes.

Only two oxidizing agents have been used commercially in any volume—air and nitric acid. These have produced the aromatic dibasic carboxylic acids and their derivatives, including phthalic anhydride and dimethyl iso and terephthalate.

No single process appears to be completely satisfactory for the oxidation of all three isomeric xylenes to their respective phthalic acids.

A commercial process for manufacturing dimethyl terephthalate was developed.[23] Nitric acid is used commercially as the oxidizing agent for conversion of p-xylene to terephthalic acid.[24]

At least one commercial process now exists for the oxidation of each xylene isomer to its corresponding dibasic acid.

Phthalic Anhydride

The large-scale manufacture of phthalic anhydride from o-xylene was begun in 1945. In many respects, the process resembles the commercial process employed for the oxidation of naphthalene. The preferred catalysts contain oxides of vanadium in both instances, but the methods of catalyst preparation and the types of support employed differ.[25,26,27,28]

Process . . . A commercial installation for the production of phthalic anhydride from o-xylene has been described.[29] O-xylene is pumped from storage tanks through a steam-heated vaporizer to a mixer where it contacts a stream of air, which has first been filtered, then compressed, and finally preheated.

The mixed stream of vapors passes to the converter, which contains the catalyst supported in the multiple tube bundle. The heat of reaction is usually removed by a molten salt bath which circulates externally through a cooler. The exit gases from the converter pass through a vapor cooler, which can be used to generate steam, and then pass to condenser boxes for recovery of the crude product.

The products are collected periodically as solid crystals and are fed to a melt tank, which is blanketed with inert gas, and which permits the gradual vaporization of entrained moisture. Final purification is performed in a two-stage distillation, from which a heart cut is passed to chilled rolls which give a final product in flake form which is bagged for marketing. Close quality control is maintained throughout the purification process, and any off-test material is sent back to the melt tanks for reworking.

Oxidation of M- and P-Xylenes

The over-all process from xylene to the dimethylphthalates involves four steps, (1) the liquid-phase air oxidation of the xylene to toluic acid, (2) esterification with methanol to give the methol toluate, (3) oxidation of the ester to the corresponding methyl hydrogen phthalate, (4) and a final esterification with methanol to the dimethylphthalate.[30,31]

Oxidation of P-Xylene

A chemical oxidation process employing nitric acid of about 30 per cent strength at about 200° C. is used to produce terephthalic acid from p-xylene.[24] The acid then must be esterified. P-toluic acid is produced with the terephthalic and can be separated and recycled. Yields range around 85 per cent of theory.

Purification . . . The dimethyl iso and terephthalates can be purified by distillation or crystallization to the desired degree of purity required for the particular end use for which they are intended.

Rather than separate the xylene isomers before oxidation, the acids and esters[32] may be separated afterward. For instance, a eutectic with a melting

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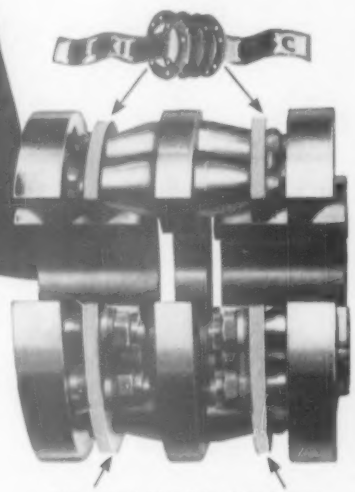

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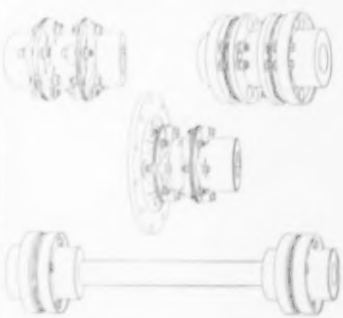

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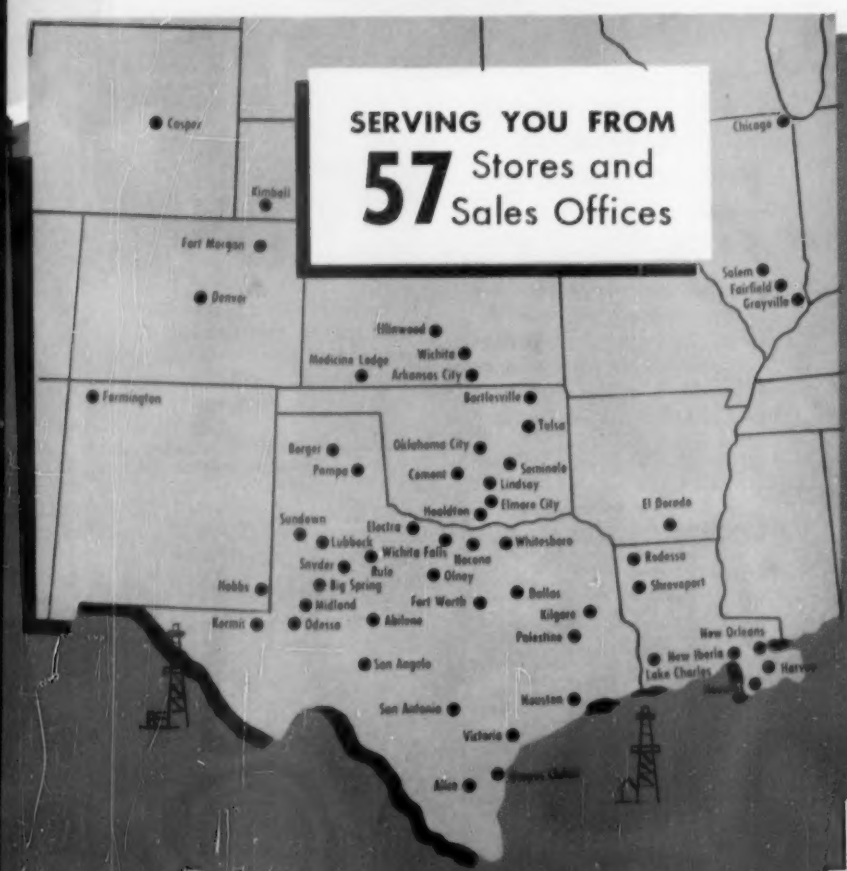

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point of 62.5° C., containing about 11.5 per cent dimethyl terephthalate, exists in mixtures of dimethyl iso and terephthalate, permitting separation of pure dimethyl terephthalate from the oxidation of such xylene blends as a 70-30 mixture of m- and p-xylenes obtained from certain refinery streams.[23] The free dibasic acids can be separated by solubility differences of their tertiary amine salts[33] or by differences in rates or degree of esterification.[34]

References

(Many additional references are given in original W.P.C. paper.)

1. Rossini, F. D., et al., "Selected Values of Hydrocarbons," Washington, D. C., U. S. Government Printing Office (1947).
2. Dressler, R. G., U. S. Patent 2,533,232 (to California Research Corp.) issued Dec. 12, 1950.
3. Schulz, R. R., Editor, Chem. Week, 70, No. 16, 35 (1952).
4. Spannagel, H., and Tschunkur, E., U. S. Patent 1,940,065 (to I. C. Farbenindustrie Aktiengesellschaft) issued Dec. 19, 1933.
5. Tegge, B. R., Carlson, C. S., and Stewart, J., U. S. Patent 2,672,487 (to Standard Oil Development Co.) issued Mar. 16, 1954.
6. Arnold, J. H., U. S. Patent 2,541,682 (to California Research Corp.) issued Feb. 13, 1951.
7. Booker, J. D., U. S. Patent 2,651,665 (to Standard Oil Development Co.) issued Sept. 8, 1953.
8. Greenburg, R. B., U. S. Patent 2,398,526 (to Allied Chemical & Dye Corp.) issued Apr. 16, 1946.
9. McArdle, E. H., and Mason, D. M., U. S. Patent 2,435,792 (to Standard Oil Development Co.) issued Feb. 10, 1948.
10. Arnold, A. A., and Kneisley, J. W., ACS Symposium on Petrochemicals in the Postwar Years, No. 28, 125, Sept. 6-11, 1953.
11. Mason, D. M., U. S. Patent 2,530,978 (to Standard Oil Development Co.) issued Nov. 21, 1950.
12. Birch, S. F., Fieler, F. A., and Haresnape, J. N., U. S. Patent 2,532,276 (to Anglo-Iranian Oil Co.) issued Dec. 5, 1950.
13. British Patent 677,368 (to California Research Corp.) issued Aug. 13, 1952.
14. Brooke, L. F., Langlois, G. E., and Strickland, A. E., U. S. Patent 2,521,444 (to California Research Corp.) issued Sept. 5, 1950.
15. Burke, R. E., U. S. Patent 2,343,744 (to Standard Oil Co. of Ohio) issued March 7, 1944.
16. Lien, A. P., and McCaulay, D. A., U. S. Patent 2,528,892 (to Standard Oil Co. of Indiana) issued Nov. 7, 1950.
17. McCaulay, D. A., Shoemaker, B. H., and Lien, A. P., Ind. Eng. Chem. 42, 2103 (1950).
18. Beach, L. K., Nelson, J. F., and Stewart, J., U. S. Patent 2,506,289 (to Standard Oil Development Co.) issued May 2, 1950.
19. Hetzner, H. P., and Miller, R. J., U. S. Patent 2,511,711 (to California Research Corp.) issued June 13, 1950.
20. Sturrock, M. G., Lawe, T., and Kemp, W. E., U. S. Patent 2,439,228 (to Dominion Tar & Chemical Co., Ltd.) issued Apr. 6, 1948.
21. Schlatter, M. J., A.C.S. Symposium on Petrochemicals in the Postwar Years, No. 28, 79, Sept. 6-11, 1953.
22. Schneider, A., U. S. Patent 2,648,713 (to Sun Oil Co.) issued Aug. 11, 1953.
23. Albert, A. A., and Kneisley, J. W., A.C.S. Symposium on Petrochemicals in the Postwar Years, No. 28, 125, Sept. 6-11, 1953.
24. Burrows, L. A., Cavanaugh, R. M., and Nagle, W. M., U. S. Patent 2,636,899 (to E. I. du Pont de Nemours & Co., Inc.) issued Apr. 28, 1953.
25. Levine, I. E., U. S. Patent 2,521,466 (to California Research Corp.) issued Sept. 5, 1950.
26. Levine, I. E., and Claussen, W. H., U. S. Patent 2,474,002 (to California Research Corp.) issued June 21, 1949.
27. Toland, W. G., Jr., U. S. Patent 2,574,511 (to California Research Corp.) issued Nov. 13, 1951.
28. Toland, W. G., Jr., U. S. Patent 2,574,512 (to California Research Corp.) issued Nov. 13, 1951.
29. Levine, I. E., Chem. Eng. Progress 43, 168 (1947).
30. Katzschmann, E., German Patent Application P 4344 (to Imhausen & Co., Ltd.) filed July 4, 1951.
31. Mittag, R., German Report PB 565, I. G. Farbenindustrie Aktiengesellschaft, Apr. 28, 1951.
32. Pino, M. A., U. S. Patent 2,656,377 (to California Research Corp.) issued Oct. 20, 1953.
33. Toland, W. G., Jr., U. S. Patent 2,664,440 (to California Research Corp.) issued Dec. 29, 1953.
34. Agnew, R. J., and Conary, R. E., U. S. Patent 2,569,440 (to The Texas Co.) issued Oct. 2, 1951.

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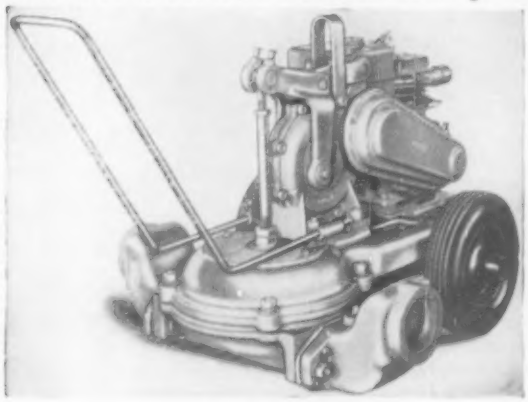

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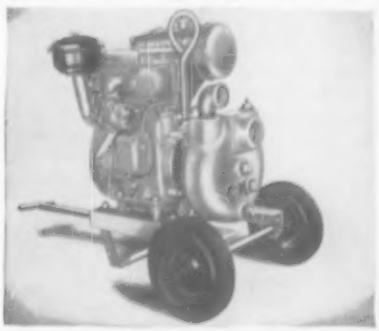

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Tips on Selecting Rod Pumps

Don't let first cost rule out other considerations. Look instead for a unit that will deliver its production for the longest time and at least cost for upkeep

by R. T. Shoemaker

THE four most often encountered oil-well-pumping problems are:

1. Gases
2. Sand
3. Corrosion
4. Scale (more commonly called gyp)

Gas is generally associated with the first stages of pumping followed by sand if the formation structure is of that type. As the well is gradually depleted, corrosion seems to be closely associated with the increase in the volume of water produced. Scale formation is also closely associated with increased volume of water.

Pump Size

The rod pump should be selected not for just the first cost but so that it will make its production for the longest time and require the least amount of service and maintenance expense.

The optimum pump bore must be calculated first. To decide this, the amount of fluid to be pumped must be determined. Some operators think it is advisable to swab a well for several days to determine its daily capacity if it is a new well going on the pump. In addition to the amount of fluid to be lifted we must also consider, in selecting the correct pump bore, the depth, the rod and tubing stretch, the sucker-rod stress and the probable efficiency of the pump.

If the well is deep it is possible that a 1¼-in. pump will make more fluid than a 1½-in. pump because the greater fluid load of the 1½-in. pump causes more stretch in the rod string than the 1¼-in. pump. The plunger does not move at the beginning of the upstroke until all the stretch in the rods has been reached. Sucker rods stretch because each rod in the string supports the rods below it and all the fluid load. Thus the larger the pump bore the greater the stretch will be in the rods with the resulting decreased plunger travel.

At a pump-setting depth of 7,500 ft., 2½-in. unanchored tubing, ⅞ and ¾-in. tapered rods, sixteen 54-in. s.p.m. and 1¼-in. bore pump will make more fluid than the 1½-in. pump because the loss due to stretch is 47.2 in. with the 1½-in. pump and only 34.2 in. with the 1¼-in. pump. The 1¼-in. pump also has the advantage in this case of lowering the stress on the top rod of each size by 4,000 psi. The torque also is 44,000 in.-lb. less when the 1¼-in. pump is used than when using a 1½-in. pump. This results in a better installation when the 1¼-in. pump is used for the rods, pump, and unit.

Author is with Oil Well Supply Division, United States Steel Corp., Dallas. Paper presented at Texas Tech. College Oil-Lifting Short Course, 1955.

Deep wells . . . In selecting the pump bore for a deep well the stress on the top rod or top rod of each size, if a tapered string is used, is often the limiting factor. Sucker rods have a lower margin of safety than steel used for most any other purpose because of the limits to their size. Most rod manufacturers suggest that the safe working-load limits of a sucker rod should be half of the yield strength of the steel.

For example, nickel moly steel sucker rods of the 4615 steel class have a yield of 70,000 psi. If the fluid to be pumped is ideal, in that it is free from any corrosion, it may be safe to stress the rod to one half the yield or 35,000 psi. However, if there is hydrogen sulfide gas, carbon dioxide gas, salt water, or electrolytic corrosion the safe working limit will be much lower than 35,000 psi., the amount of decrease being dependent on the degree of the corrosion that is present.

1. Gases

In selecting pumping equipment for oil wells, it should be remembered that in most cases some component parts of the fluid being pumped are above or near their boiling points at pressure and temperature conditions existing within the pump. This means that with a slight drop in pressure on the well fluid, a large volume of dissolved gases and vapors may be set free, in addition to any free gas in the well formation. For this reason it is very difficult to pump some wells down, and many wells will apparently pump off with several hundred feet of fluid standing in the hole.

This is due to the fact that the condensable vapors and gases occupy the entire displacement volume of the pump. The pressure below the plunger cannot be raised sufficiently to overcome the tubing pressure above the traveling valve. This pressure must be raised before the traveling valve can open and deliver oil to the tubing. This is known as "gas-lock." To minimize gas-locking as much as possible, the following precautions are offered:

Precautions for all pumps

1. Position the pump so that the traveling valve and standing valve come as close to each other as possible at the lowest position of the pump stroke without making contact.
2. Use as long a stroke as possible with the equipment available.
3. Flow velocities and turbulence at the pump inlet should be kept at a minimum. This is accomplished by using the largest standing valve possible and a suitable gas anchor with the largest possible flow passages.
4. Use the largest standing valve possible so that there will be a minimum pressure drop across the face of the valve.
5. Where the gas is at the top of the oil, considerable gas is eliminated from the pump by placing it below the gas section of the zone.

Precautions for rod pumps

1. The compression ratio should be made as high as possible. This is accomplished by using a closed-cage type valve below the plunger in a stationary barrel pump, or a valve above the plunger with a traveling barrel type pump.
2. The casing pressure should be kept to a minimum.

Precautions for tubing pumps

The choice of regular or oversize standing valves may be dictated by strength requirements of the valve cage for use is deep wells inasmuch as the cage may be subjected to the sucker rod load when spacing the pump or in the case of a rod failure.

Gas anchor

In general, where gas anchors are used, the pressure drop through the

gas anchor is greater than that through the standing valve because of the greater length of the gas anchor flow passage. In many cases the inside diameter of the gas anchor is less than that of the standing valve. It is important to make this connection as large as possible for handling extremely gassy or volatile fluids.

2. Sand

Some sandy wells have high maintenance costs because of pump failures. The most difficult well to pump is the stripper well that has a sand pay and a very small volume of fluid. Bottomhole pumps can handle some sand without excessive wear if there is enough fluid available to keep the sand moving through the pump.

A pump made out of the hardest and most wear-resistant materials in both barrel and plunger will soon wear out if the fluid velocity through the pump is not great enough to keep the sand in the fluid moving through the pump. When the well is pumped down, greater amounts of sand will heave in the well bore and the movement of the fluid through the tubing will be so reduced that the sand will settle out on the pump.

Then the plunger may only be churning up and down in the sand. The pump will rapidly wear and the sand will jam in the resulting greater clearance of the barrel and plunger. This may make it necessary to clean out the well. The following practices may overcome some of the difficulties in pumping sandy wells of low fluid volumes:

1. Use the smallest pump bore possible.

2. Slow the pumping speed down and use a long stroke. The small pump and slow-speed operation will retain a higher fluid level and help prevent loose sand sloughing in from the formation.

3. In heavy sand wells intermittent pumping may not be successful because too much sand may settle out of the fluid, in the "down" period, on top of the pump. Generally intermittent pumping is better than pumping off and pounding fluid.

In wells having sand formations or wells than have been given sand frac jobs the pump should be designed as follows:

1. Use double valves. There has been considerable discussion concerning the desirability of two balls and seats in series and it has been argued that the load cannot distribute itself between the two valves, and only one will form a tight seal on any particular stroke. This line of reasoning has led

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As wells are drilled rams must be changed frequently to meet requirements of varying pipe sizes. In Shaffer Hydraulic Gates you simply open two doors in the side of the body, slide out the ram assembly, change rams, replace the assembly and bolt the doors shut. Closing the doors automatically aligns the rams within the body. And complete ram changes can be made with equal ease whether the pipe is in or out of the hole!

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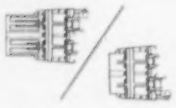
Extra Value #3

POSITIVE DIRECT DRIVE

In Shaffer Hydraulic Gates there are no yokes or complicated secondary hook-ups between rams and operating cylinders. For positive action, fewest parts, simplest maintenance, the hydraulic cylinders are directly behind the rams — on the same shaft. And note how all operating parts are completely enclosed within the gate body, protected from corrosion or damage.

Extra Value #4



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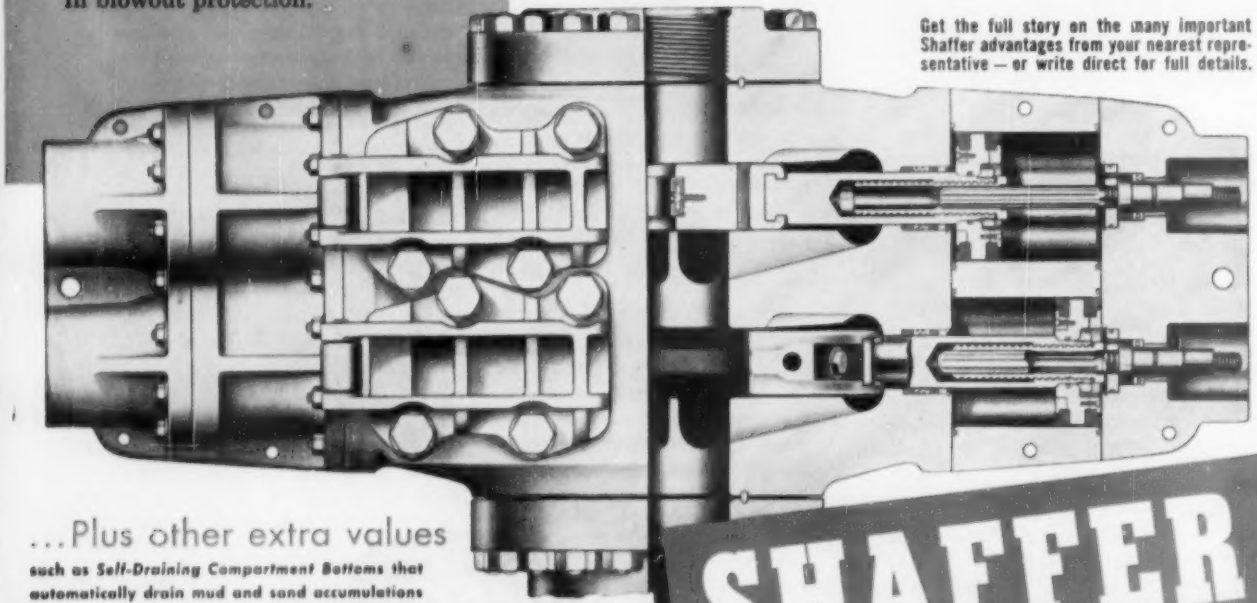

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to the conclusion that two valves in series cannot be of any particular advantage.

However, experience has shown that two valves in series will give much longer service than a single valve if the valve life is determined by wear, or fluid cutting, rather than by corrosive action. This result appears entirely logical where sand or other solid material is lifted with the oil. In such cases failure is likely to occur as a result of fluid cutting when a solid particle is caught between the ball and seat and prevents perfect seating.

A pressure differential of 2,000 psi. will produce a jet of fluid having a velocity of over 500 ft. per second, and such a fluid velocity can easily damage the lapped valve-seating surface on balls and seats in a short time, especially if the fluid jet carries solid material in suspension.

The life of a ball and seat will depend largely on the number of times it is subjected to the action of such fluid jets, and this can be decreased greatly by the use of double valves, inasmuch as a jet cannot occur until both balls are held off their seats during the same stroke.

For example, if conditions are such that a single ball and seat is prevented from seating properly 1 out of each 100 strokes, on the average, the chances of both of two valves in series failing to seat properly will be reduced to 1 in 10,000 strokes. Furthermore, when this occurs the pressure drop will be distributed between the two leaking valves and the cutting action will be less severe than with a single valve.

The extra first cost of double valves is so small in comparison with the average pump-pulling job that the use of double valves should be well justified by the savings resulting from fewer pulling jobs. Also, fewer balls and seats should be required over a long period of operation because of the much greater life to be expected under average conditions.

The only apparent objection to double valves is the possibility of affecting pump efficiency by the slight added pressure drop at the pump inlet, when pumping highly volatile and gassy fluids, especially when it is necessary to pump the well down to a low fluid level to produce its allowable. Any influence on production can be determined by making alternate runs with single, and double, standing valves. In the case of traveling valves, the use of double valves of standard size cannot adversely affect production rates.

The contents of the pump barrel

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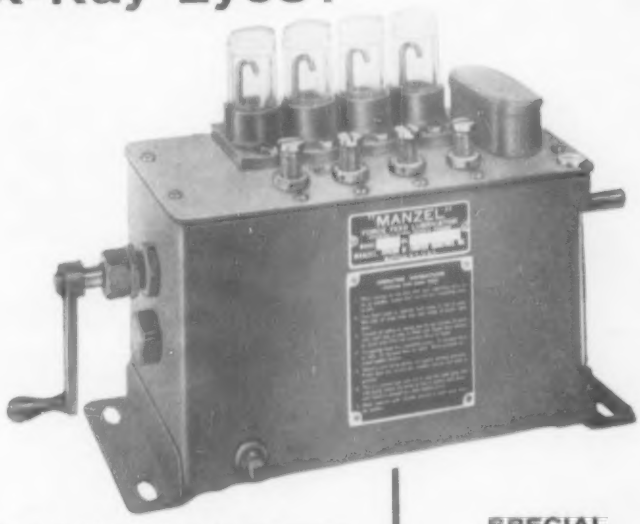

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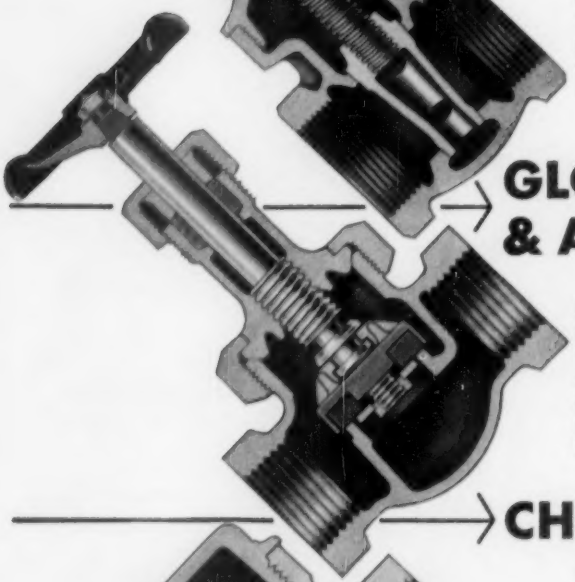
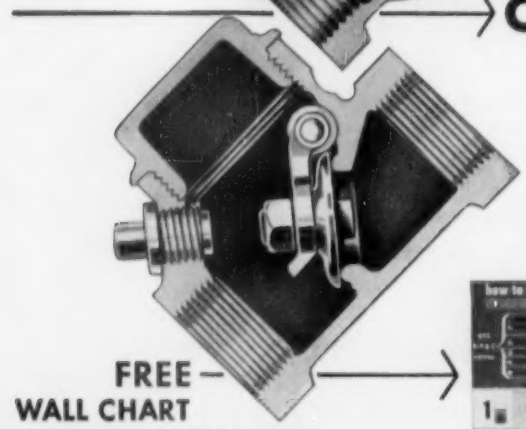
GATES

Fig. 86 illustrated, rated for 125 lbs., steam, 200 OWG, has stationary stem, solid wedge, screwed ends. Other 125 lb. models with screwed bonnet, rising stem, solid or split wedge.



GLOBES & ANGLES

Fig. 1A Globe illustrated, rated 150 lbs. steam, 300 OWG, has renewable asbestos disc, union bonnet. Also furnished as Angle. Sizes ⅛" to 3".



CHECKS

Fig. 198 illustrated, rated for 125 lbs. steam, 200 OWG. Other swing check valves in 150, 200, 300 lb. classes.

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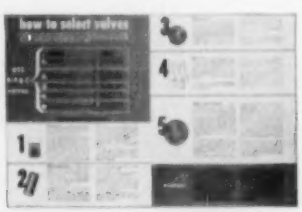

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Better Values

must be raised to the tubing pressure of several hundred, or several thousand, pounds per square inch before the traveling valve will open, in any case, and the extra pound or two required to overcome the resistance of an additional valve is of no significance. We have seen many fractured wells that just wouldn't pump at all with single valves.

2. Usually pumps having extremely hard surface barrels and plungers are most economical for sand wells, in spite of these type pumps being higher priced than common cold-drawn precision-honed steel-barrel type of pumps that are unhardened. Such premium-priced pumps have better resistance to sand abrasion and will outlast the cheaper pump many times.

After a sand frac job on a well, some operators will run a precision hard-surface premium-priced pump or a three-tube pump and only leave this pump in the hole until the well is fairly well cleaned up. Then after they believe the excess sand is already pumped out and the well is settled back to a stable rate of production, they will then run back the lower-priced pump.

3. Generally plain plungers are better than grooved plungers for sandy wells. The sand tends to lodge in the grooves.

4. On the proper clearance between barrel and plunger in sandy wells, there are two schools of thought. There are those who like a fit to be as much as 0.008 in. They use longer plungers and they think that sand particles will slip past the plunger rather than sticking or galling it. They may be right for pumping wells of heavy-viscosity oils.

Others prefer using pumps with close tolerances. If a pump can be assembled with only 0.001-in. clearance and it strokes free and easy with a 10-weight lubricating oil, it is better suited to the fluids in West Texas. The clearance should be kept to a minimum because sand cannot wedge in such a small clearance causing the pump to jam and stick. These close-clearance pumps have been very successful in sand-frac wells at Crane, South and North Cowden, and in Andrews County. Wherever sticking has occurred it has been after the pump has been in service so long that wear has increased the clearance.

5. A traveling-barrel type of pump is excellent for sandy wells except those with such high volumes of heavy sand that it might settle on top of the seating cups. Then the traveling barrel can pound on the settled sand shortening the stroke. Stationary-barrel pumps are

also suitable for pumping sand wells. Top-hold-down stationary pumps are not as apt to become sanded up in the tubing as bottom-hold-down stationary pumps.

Sand from the tubing may settle between the pump tube and tubing of a bottom-hold-down stationary. This sand may pack so tight that the pump cannot be pulled and then it must be stripped out. This cannot happen with a top-hold-down which makes it preferred in most sandy wells.

3. Corrosion

Hydrogen sulfide gas is the principal destroyer of subsurface pumps in the West Texas area. There are a few wells having carbon dioxide gas and some with both hydrogen sulfide and carbon dioxide. Inhibitors that are periodically injected in the casing annulus are providing protection against corrosion to the casing, tubing, rod string, flow lines, tanks, and pipe lines. But the bottom-hole pump does not get as much benefit from the inhibitor.

The close tolerance of barrel and plunger prevents the protective film coating of the inhibitor from adhering to the working surfaces. Also the valve rod works through the neck of the guide or on a traveling-barrel pump; the pull tube works through a pull nut. This rubbing action prevents the protective film from forming.

Perhaps if we could reduce the bottom-hole temperature we could retard pump corrosion. A rise of 20° F. approximately doubles the chemical action of corroding acids. In pumping a well with a pressure of 2,000 psi. any gas collected in the pump barrel must be compressed to this pressure before any fluid can be delivered to tubing.

If oil and methane or H_2S gas are being pumped from a well having a bottom-hole temperature of 150° F. with an intake pressure of 20 psi., the temperature of the gas when compressed to 2,000 psi. can rise to a value above 1,300° F. Still higher temperatures can result from higher fluid pressures, lower intake pressures, higher bottom-hole temperature, or any combination of these factors. This explanation of high temperature causing an accelerated corrosive action is logical because burnt plungers are often found in pumps.

To reduce the temperature caused by the compression of gas, we could do the following:

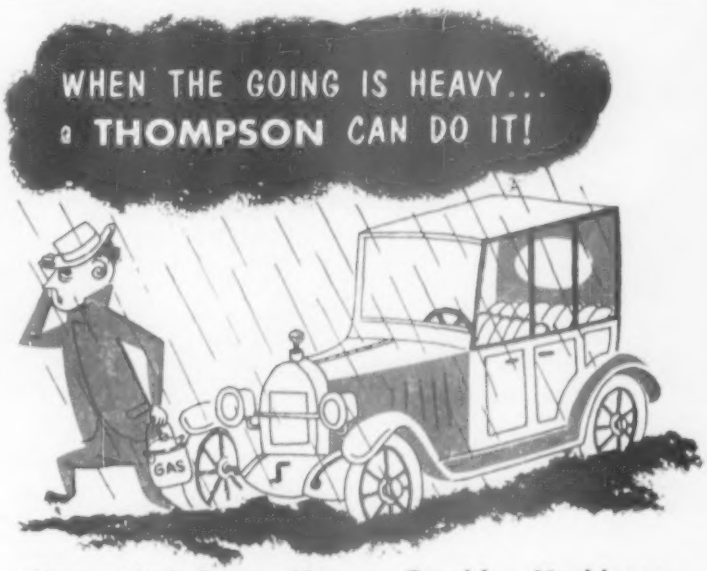
1. Space the well so that the traveling valve just almost strikes the standing valve on the bottom of the down stroke. This reduces the volume of collected free gas between the valves, and the compression is accomplished quicker to overcome the pressure differential of above and below the traveling valve.

2. Use double traveling valves. The upper ball and seat will be protected from the high temperature by the fluid between the two valves. The standing valve is immersed in fluid and will not be adversely affected by the high temperature.

3. Use large pump inlets to reduce restrictions at pump entrance.

It is usually the case that corrosive wells are also very abrasive. The abrasives may partly be from the pay zone but we believe that iron sulfides caused by the corrosion on the tubing and rods also contribute to wear on the barrel and plunger of a corrosive well. In selecting a pump we need not only materials that are very resistant to corrosion but we also need a barrel and a plunger that have extreme hardness and resistance to abrasion such as we recommended for sandy wells. We need a close clearance here for corrosion also.

The cause of pump failures in corrosive wells is easily at least 50 per cent due to excessive wear. The ideal metal for barrel and plunger would be one that is extremely hard and wear resistant and not subject to corrosion. High-nickel-moly steels are very successful. The nitriding of the bore of high-nickel-moly steel tubes has ac-



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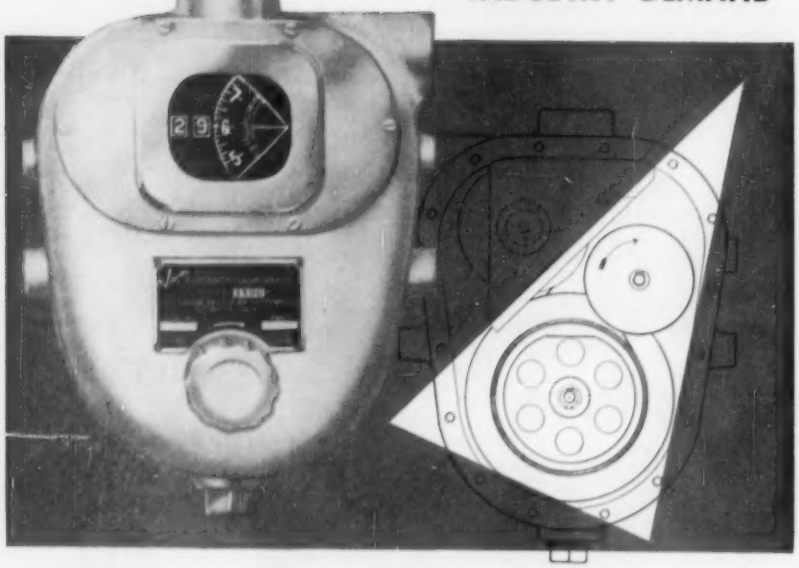

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Engineering at Midyear

complished two things to improve the pump barrel. The nitriding produces a shallow penetration of hardness in the bore and it improves the corrosion resistance to such an extent that the barrel is often not even discolored after running in a corrosive well.

4. Scale—"Gyp"

There doesn't appear to be much written on the mechanics of scale or "gyp" forming in the rod pump, tubing, and sucker rods. Scale generally forms after the well is producing large volumes of water. The scale deposits in a majority of cases contain carbonates. These chemical compounds either in solution at the static formation pressure or are dissolved out of the formation by the movement of the water to the well bore.

When the supersaturated solution reaches the pump the pressure is released and the saturated salts solidify on any nonwearing surface. We have seen tubing that was almost completely closed with this scale or gyp deposit. There are many chemicals on the market that can be used in the same manner as corrosion inhibitors to prevent such deposits. These deposits create a serious problem in the rod pump. The deposit forms on that part of the barrel that does not contact the plunger on the pumping stroke. When a slight change of the plunger stroke occurs, the scale may wedge the plunger so tightly that a stripping job is necessary. This of course is expensive.

In such wells the following corrective measures should be employed:

1. Use a stroke-through pump. Such a pump is designed so that the plunger can stroke out the bottom and top of the barrel. The length of barrel or liners should be of such length to permit the plunger to stroke through.
2. Use all-metal plunges.
3. Secure a sample of the well fluid and have it chemically tested. From such tests the proper chemical can be introduced into the casing annulus to keep the carbonates or other salts in solution.

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by H. B. Breedlove

Using a Variable Ratio Relay for Closed-Loop Blending Systems

THE first installation of a closed-loop blending system at the Baton Rouge Esso refinery was made in 1946. This installation has been in service continuously since that date. The system involves the blending of two light-liquid streams to a specified composition final blend.

A straightforward flow-ratio controller was tried, but was found to be inadequate because of variations in the composition of one of the component streams. Continuous analyzers were available for determining the composition of component streams and final blend. Even with the analyzer information and constant attention from the operator, the variation in composition of the final blend was much greater than desired.

Closed-loop control . . . A simple system was designed and installed. This is shown in Fig. 1. It consists essentially of a thermal-conductivity-type analyzer, a primary flow controller which is installed on the total blend stream, and a secondary flow controller with pneumatic index set, which is installed on the B stream.

The novel feature of the system is a pneumatically set ratio relay which was designed, fabricated, and installed to set the ratio between the total stream and the B stream. The analyzer controller is connected to the ratio set point of the ratio relay and adjusts the ratio between the primary total stream and the secondary B stream. With this system, it is required only to set the percentage of B stream desired in the blend and the rate of blend makeup. As the percentage of B component in the A stream varies, the analyzer controller resets the ratio between the A and B streams, thereby maintaining a constant percentage of component B in the total blend.

This system has worked so satisfactorily that two more installations have been made and several more complex systems have been designed using this basic principle. We foresee many applications of this type instrumentation which are more complex than this simple blending problem.

Paper presented at Texas A. & M. Instrumentation Symposium.

Pneumatic Set-Ratio Relay

The ratio relay was designed and fabricated locally because no instrument of this particular type was commercially available in 1946. However, several instrument manufacturers have recently announced relays which are adaptable to closed loop systems.

Bellows . . . This pneumatic set-ratio relay consists of a primary receiving bellows which is connected to the transmitted air from the primary flow-control transmitter as shown in Fig. 2. The primary bellows is spring-loaded so that its motion is linear with transmitted air pressure applied and is connected to a lever.

A spring-loaded secondary bellows is connected to linkage so that the ratio of motion is changed between two levers which are pivoted at opposite ends. One of these levers positions a flapper valve with respect to a nozzle. The nozzle is connected to a pneumatic pilot valve and the output of the pilot valve is connected to a third spring-loaded bellows.

This is the followup mechanism of this system. The output air pressure of the pilot valve is in effect a multiplication of the primary and secondary air pressures. The system is very flexible and permits adjustment to produce a wide range of ratios between the primary-input air pressure and the secondary-output air pressure.

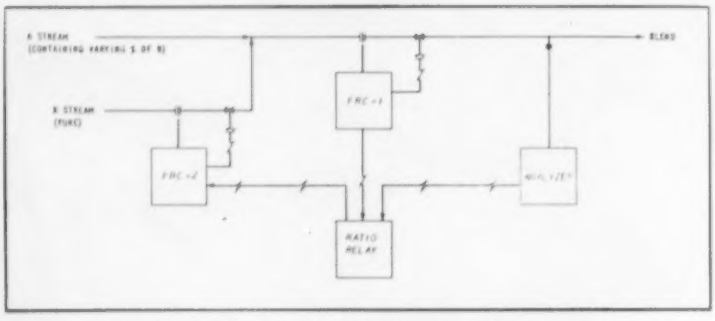

Fig. 1—Schematic of a closed-loop blending system.

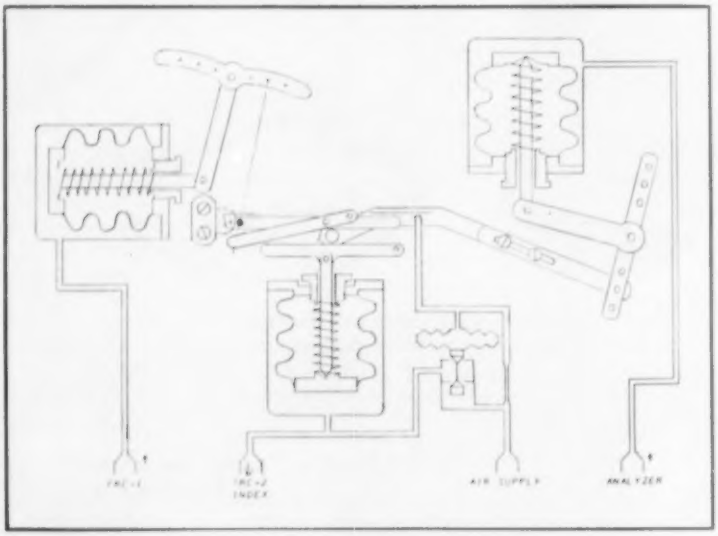

Fig. 2—A variable ratio relay.

CHEMICAL SURFACTANTS—3

Increasing Production by Reducing Water Saturation

by C. E. Clason

INCREASING the permeability of the formation to oil, as mentioned above, can be a considerable factor in increased oil flow. In a sandstone formation with its varied and tortuous small flow channels, the amount of water present in the formation has a direct bearing on the quantity of oil that can flow through. Buckley and Leverett have produced a curve (Fig. 4) of relative permeability against oil or water saturation which can be used to show the possibilities for increased production when a change in water saturation can be produced by chemical treatment and reduction of film strength of the water.

Although unknown values do not permit exact evaluation, we can illustrate this curve in this way. Assume a formation to have 20 per cent connate water. Then the formation is exposed to water or drilling mud in such a way that more water is introduced, replacing oil around the well bore. When production is again started, some of this water will move on out, but never down to the former 20 per cent content. The formation pressure is the same as before, but a greater water saturation lowers the permeability to oil, so less production results. This has happened many times and is well known. In fact, sometimes oil flow is entirely shut off.

Now a chemical surfactant treatment lowers the film strength and I.T. of water, allowing more water to be carried out by the fluid movement. The water saturation figure is thus reduced. If the reduction is from 50 per cent back to the original 20 per cent, the increase in permeability can be 10 times. From 30 to 20 per cent would be twice the permeability. It is possible that the original 20 per cent connate water may be lowered toward a minimum of 10 per cent. From 30 per cent down to 10 per cent presents an increase of 10 times the permeability. A maximum condition for flow without further increase by fracturing or acidizing can be established or is possible of attainment.

Calculations by Muskat give the increase in production by increasing the permeability (K) of the formation (to oil in this case) to the radius outward as shown:

	25-ft. R	10-ft. R	5-ft. R	1-ft. R
2K	1.6	1.5	1.4	1.2
2.25K	1.9	1.65	1.5	1.3
3.33K	2.4	2.2	1.9	1.4
5K	3.4	2.9	2.5	1.7
10K	6.3	5.0	4.4	2.6

Again we do not know, but we suspect that the influx of water has also created some water-oil emulsion which must be broken to increase production. No agent should be used that aids in forming emulsions rather than the opposite.

It is evident then that these two conditions have the greatest bearing on results, and that mere displacement pressures are a minor consideration. We are more concerned with what happens after movement starts.

The same principle has been applied in acidizing for years in that emulsions are prevented between acid, spent acid, and oils. It has been recognized as one of the greatest aids to the process. Less emphasis has been placed on claims for penetrating acid as originally conceived. The analogy seems to be a case of repetitive history and return to basic principles.

We will always be on the right track to combine reduction of film strength and breaking of emulsions. Reduction of I.T. to a lower value can possibly give greater ability for breaking emulsions, thus pointing to the reason for the superiority of one product over another in some cases, and of both over products which can and do form emulsions of varying stability.

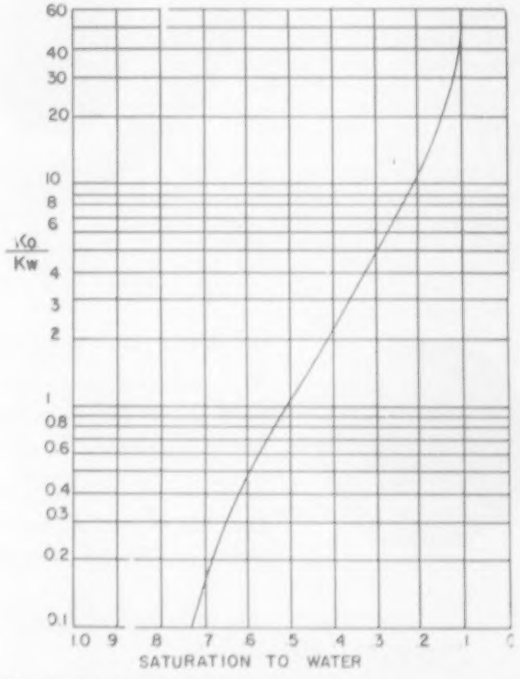

Fig. 4—Relative permeability ratio vs. water saturation, according to Buckley-Leverett's theory.

Author is with Halliburton Oil Well Cementing Co.

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by W. L. Nelson
Technical Editor

QUESTIONS ON TECHNOLOGY

Prices of Industrial Steel Materials

Can you supply us with the base 1946 prices (or recent ones) for the materials listed on your Cost-imating page of April 11, 1955, as steel finished?—G.M.P.

Prices compared to 1946 for the item carried as "steel finished," in the quarterly issues of Cost-imating (January, April, July, and October) have been as follows. Indexes for structural steel shapes are also shown for comparison:

	Steel finished	Steel structural shapes
1926	88.4	84
1928		80
1930		73
1931		70
1932		68
1933		72
1934		77
1935		78
1936		80
1937		95
1938		93
1939		91
1940		90
1942		90
1944	89.1	90.5
1945	95.2	90.5
1946	100.0	100.0
1947	118.9	113.4
1948	135.7	138.0
1949	146.5	151.2
1950	153.7	162.3
1951	166.3	172.3
1952	170.0	176.2
1953	182.7	185.7
1954	190.5	193.4
Dec. 1954	193.0	196.6

TABLE 1—DESCRIPTION OF ITEMS COMPOSING "STEEL FINISHED" AND THEIR PRICES DURING 1946, F.O.B. MILL OR PRODUCING AREA

Code*	Price, 1946	Index Dec. 1954 (1946 = 100)	Description
10-14- 1	$2.405/cwt.	194.8	Rails, standard heavier than 60-lb., No. 1, open hearth
10-14- 6	3.677/cwt.		Spikes, track cut
10-14-11	5.575/cwt.		Bolts, track
10-14-16	2.531/cwt.	208.2	Tie plates, steel
10-14-21			Joint bars, railroad
10-14-26	2.467/cwt.	187.3	Plate, carbon steel, ½ by 24 in. to 72 in. wide, base lengths
†10-14-31	2.317/cwt.	196.6	Structural shapes, standard, carbon steel, I-beam, 12-in. depth, 60-ft. length, A.S.T.M. (A 7-46)
10-14-36	0.718/lb.	206.8	Bar, tool steel, high speed, 18-4-1 alloy
10-14-37	3.76/cwt.	200.3	Bars, alloy, hot rolled, S.A.E. 3120 open hearth
10-14-38	.....	....	Bars, hot rolled, stainless steel, Type 501 molybdenum
10-14-39	2.471/cwt.	190.8	Bars, carbon steel, hot rolled, merchant bar quality, ¾-in. random lengths
†10-14-41	2.329/cwt.	230.8	Bars, concrete reinforcing, billet steel, straight lengths, 1-in. square or round
†10-14-42	3.054/cwt.	195.7	Bars, cold finished, carbon steel, 1-in. round random lengths, standard quality
†10-14-46	3.452/cwt.	186.0	Sheets, hot rolled, carbon steel, 11-gage, 36 to 48 in. wide, 10 ft. long
†10-14-47	.....	....	Sheets, cold rolled, carbon steel, 20 gage, 36 to 48 in. wide, 10 ft. long, drawing quality
†10-14-48	4.049/cwt.	176.4	Sheets, galvanized, 24 gage, 36 by 96 in.
†10-14-51	3.028/cwt.	189.7	Strip, carbon steel, cold rolled, 0.25 carbon and less
10-14-52			Strip, cold rolled, stainless steel, Type 430
10-14-56	3.955/100 ft.	199.0	Pipe, black steel, ¾-in. butt weld
10-14-57	5.215/100 ft.	178.8	Pipe, galvanized, ¾-in. butt weld
10-14-61	18.208/100 ft.	202.7	Boiler tubes, carbon steel, standard commercial seamless, cold drawn, 2 and 2¼-in., cut lengths 10 to 24-ft. composite
†10-14-66	5.00/cwt.	181.1	Tinplate, domestic coke, 1.5-lb. base box tin coating, 14 by 20-in.
†10-14-71	12.434/212 lb.	.....	Ternplate, special coated, manufacturing
10-14-76	.....	....	Wire, carbon steel, annealed, merchants, Nos. 6 and 8
10-14-81	3.815/cwt.		Wire, fence, galvanized, merchants, No. 9 gage
10-14-86	3.477/cwt.	203.3	Nails, wire, 8 d., common
10-14-91	3.173/80 rod spool	204.3	Wire, barbed, galvanized, 2 point, 4-in. 80.5 lb.
10-14-96	6.620/20 rod roll	200.5	Woven wire fence, No. 11 farm and field, 9 gage top and bottom wires, 11 gage intermediate wires, 26 in. high, 6-in. (spaced) stay wires, 7-line wires, approx. 184 lb.

*"Wholesale Price Index," Bureau of Labor Statistics, U. S. Department of Labor.
†Pittsburgh area producing points.

The various items composing the composite carried as "steel finished" in the quarterly issue of Cost-imating, and the 1946 prices of these items are shown in Table 1. Prices as of December 1954 may also be computed by multiplying by the indexes for that date which are also shown in Table 1. The composite steel-finished index of the tabulation cannot be applied separately to the prices of the various items that compose the composite class known as "steel finished," but in an emergency the composite index might be used for approximations. The yearly indexes of each of the 28 items (Table 1) can be had from the Bureau of Labor Statistics.

Compression Ratio and Power

What is the relationship between compression ratio or power output to the properties of a gasoline? Just what gasoline should we have for each engine?—W. B.

It is impossible to give a direct answer because of the many types of engines that are used and the many conditions under which they operate. About the only property of a gasoline that has received thorough study with respect to power output is octane number.

The general and approximate relationship between octane number, power output and compression ratio is:

Compression ratio—	Knock occurs at about these M.M. Oct. Nos.	Performance number (relative power output)*
4	39	29
4.5	51	35.5
5	59	40
5.5	65	44.5
6	71	49
6.5	77	55
7	82	61
7.5	87	69
8	91	76
8.5	95	85
9	98	93
9.5	101	105
10	104	130

*Compared at 100 octane number = 100 performance number.

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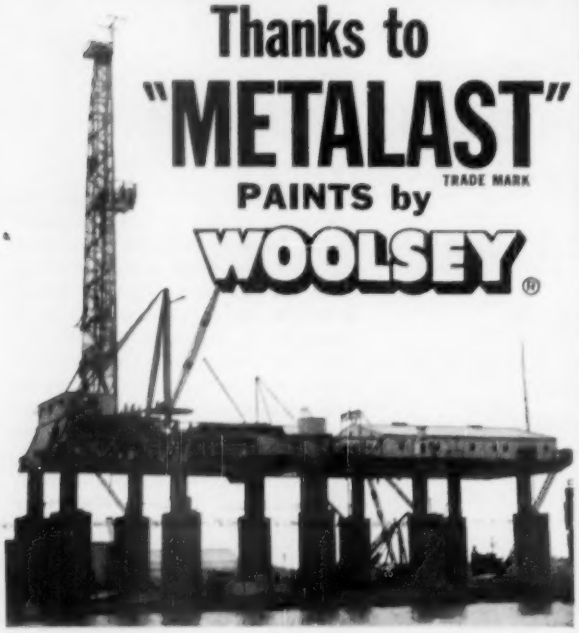

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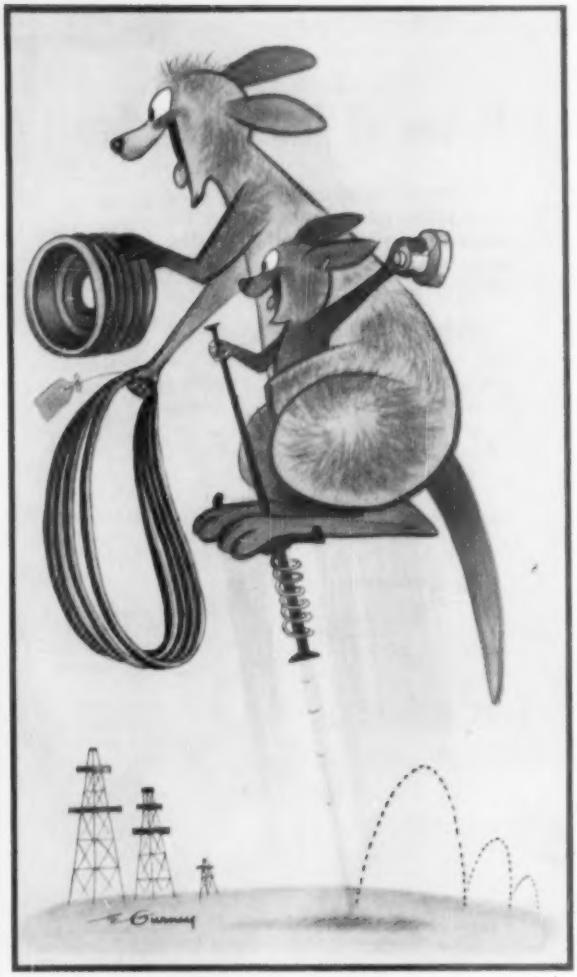

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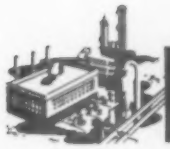

JOB IMPROVEMENT FOR THE PROCESS FOREMAN—14

What Affects the Degree of Combustion Efficiency?

Q. What is combustion and how does it occur?

A. Combustion, or burning, is a rapid chemical combination of oxygen with a fuel which results in the evolution of light and the rapid production of heat.

The oxygen for this process is obtained from the air, which contains about 21 per cent oxygen and 79 per cent nitrogen. Fuels contain the elements carbon, hydrogen, and sometimes sulfur. Complete combustion of these elements consists of the following three processes:

Carbon + Oxygen → Carbon dioxide + Heat

Hydrogen + Oxygen → Water vapor + Heat

Sulfur + Oxygen → Sulfur dioxide + Heat

In these chemical processes, the elements always combine with the oxygen in the same fixed proportion. Incomplete combustion may yield other sulfur compounds and carbon monoxide. Normal furnace operation, however, results in complete combustion.

Refinery fuels include natural gas, residue gases, and fuel oils. Gas is more easily fired than liquid fuels, but in some furnaces it has the disadvantage of producing a relatively nonluminous flame which is deficient in its ability to radiate heat.

Q. How do variations in furnace pressure and draft affect combustion?

A. Since combustion is dependent upon the supply of air and the removal of burned gases, both items must be provided for by proper furnace pressures and draft. Pressure in the combustion chamber should usually be maintained between 0.02 in. of water above atmospheric to 1.0 in. of water below atmospheric.

If the draft or pressure in a furnace ranges much from atmospheric, air will leak in and cause large heat losses up the stack. Or flue gas will be forced out through unavoidable cracks, thus heating the walls and weakening the structure.

Draft refers to the difference in pressure which tends to push or pull the air, fuel, and flue gases through furnace and boiler passes. A forced draft exists when the air and fuel are supplied to the furnace under a positive pressure so as to be pushed or forced into the combustion chamber. Forced draft is usually obtained by a fan in the air-supply line. An induced draft is furnished by placing a fan between the furnace and stack so that there is a negative pressure at the furnace exit. This negative pressure pulls or draws the flue gases out of the combustion chamber. Natural draft is furnished by the tendency of warm air to rise in a chimney or stack.

Forced draft is most easily controlled. Natural draft varies with the flue-gas temperature and is subject to fluctuations caused by the wind. Induced draft fans are sometimes objectionable because under heavier furnace firing, when there is need for more draft, the flue-gas temperature rises (weight per volume decreases) and the fan handles a smaller weight of gas; thus less pressure differential is produced.

Q. What is excess air and why should it be minimized?

A. Excess air is defined either as the air remaining after a fuel has been completely burned, or as that air supplied in addition to the quantity required for complete combustion.

Theoretically, maximum furnace efficiency is highest when a minimum of excess air is used. Practical difficulties in securing close regulation of air may, however, dictate a larger amount of air to insure some excess air at all times, particularly when the air flow is subject to varying conditions of draft.

The degree of efficiency of fuel combustion is determined by calculations involving the flue-gas analysis. This gas analysis is usually obtained by the fundamental Orsat principle which involves absorbing the oxygen, carbon dioxide, and carbon monoxide individually from a gas sample, thus obtaining their per cent of the original sample. Other methods of anlysis are based upon the specific gravity or the electrical conductivity of the flue gas.

When the rate of fuel fired is held constant, the effect of decreasing excess air is as follows:

1. The amount of flue gas will decrease, thus saving heat which would be swept out the stack.

2. Stack temperature may either increase or decrease, depending upon the number of tubes in the convection section.

3. Firebox temperature will increase because there is less cooling by the excess air.

4. The capacity of the furnace increases. The increased firebox temperature allows a higher charge rate. The decreased flue-gas volume allows a higher fuel-fired rate. This does not hold, however, if firebox temperature is already at a maximum.

5. Furnace efficiency increases. The ideal condition is approached where there is a ratio of fuel and air perfectly mixed and burned so that there will be neither an excess of fuel nor an excess of air.

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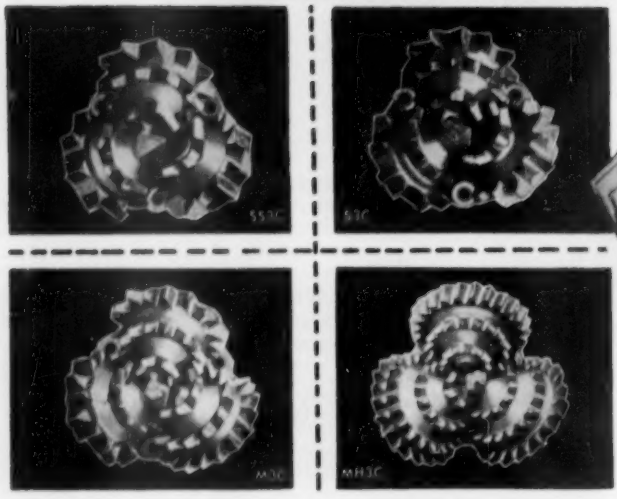

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Pike Acquires Four Rigs In Dunlap-Graham Deal

Thomas P. Pike Drilling Co., Los Angeles, has acquired all drilling equipment and auxiliary facilities formerly operated by Dunlap & Graham, Inc., Long Beach, Calif. Equipment includes four rotary rigs capable of drilling to depths of 7,500 to 12,000 ft. The acquisition gives Pike a total of 21 operating rigs. One of the Dunlap & Graham rigs is in Uruguay, where it is drilling on a government contract.

Ferrel Brothers will drill a Mississippian test for Tonapah - North Star Tunnel & Development Co. on government land in 30-26s-20e, Big Flat area, 12 miles southwest of Moab, in southern Grand County, southeastern Utah.

Noland Drilling Co., Tulsa, is starting a 6,500-ft. Devonian wildcat test for Sinclair Oil & Gas Co. at 1 Navajo, in 4-43s-22e, 4 miles northwest of Boundary Butte, in San Juan County, southeastern Utah.

Hayes & Sprague, Inc., Los Angeles, is drilling on another deep wildcat test Richfield Oil Corp. is undertaking on its Perkins in the Santa Barbara County portion of Cuyama Valley. The test, 33-35 Perkins, in 35-10-26, is set up to go to depths below 9,000 ft., possibly 11,000 ft. Location is 3½ miles northeast of South Cuyama field, and about 1 mile southeast of where Richfield drilled an 11,883-ft. dry hole.

Gist Drilling Co. has a rig under contract to Mobil Producing Co. for a 7,100-ft. Tensleep test at Heart Mountain, northwest of Cody, in Park County, northwestern Wyoming. Location, a wildcat, is at T-25-8-P, in 8-54n-102w.

Hose-Austin Drilling Corp., Casper, Wyo., is drilling for Stanolind Oil & Gas Co. at 1 NP "H," in 7-7n-44e, a wildcat in the Sunday Creek area, Rosebud County, 20 miles west of Miles City, Montana.

Clark Drilling Co., Billings, Mont., is drilling on a new wildcat test of H. Mack Cox and Ajax Oil Co. in the Howard Coulee area, 20 miles northeast of Roundup, in northern Musselshell County, South Central Montana. It is a 4,500-ft. Heath sand test. Location is on government land in 11-11n-26e.

R. W. Rine Drilling Co., Wichita, Kans., has a rig under contract to United Producing Co., of Liberal, Kans., for a 7,700-ft. Mississippian test in the new Bernstein area, in northern Hansford County, Texas Panhandle. United's new operation, 1 Smith, is a half mile east of Coats Drilling Co.'s

On hand for the completion of a step-out well Mallard Drilling Co., Wichita, recently drilled for George Hess at Windom field, in Rice County, Kansas. Front row, left to right: M. M. Miller, Hess, Allen Johnson, and Dr. Guy E. Finkle, partners in the operation. Back row, same order: M. W. Smith, geologist; P. E. Plouffe, driller; E. J. Heaps, G. H. Elmore, and S. F. Schlegel, roughnecks; and H. J. Plouffe, tool pusher.

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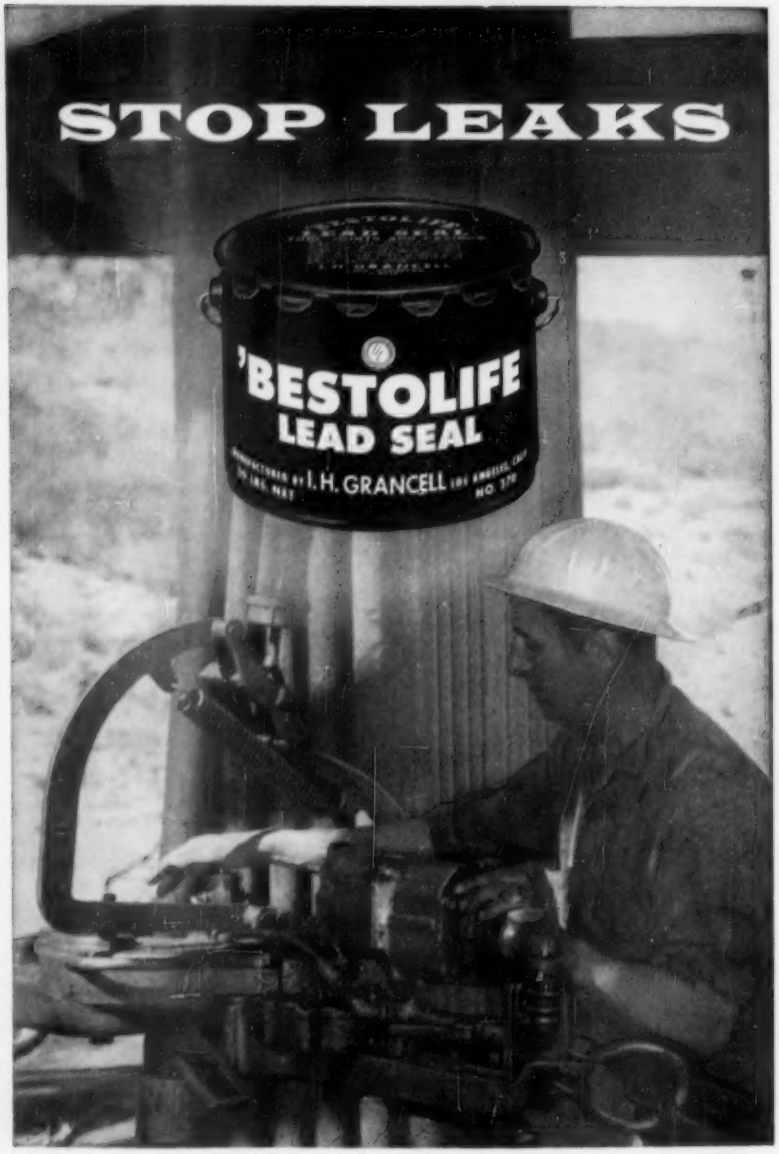

It is not easy to keep casing and tubing from leaking, especially in deep, high-pressure wells. The high percentage of metallic lead in 'Bestolife Lead Seal actually provides a plastic lead gasket for threads as joints are made up. That's why joints made up with 'Bestolife won't leak, strongly resist corrosion, and can easily be broken out—even years later. Your local supply store stocks 'Bestolife in 1¼, 5, 20 and 50 lb. cans. Unconditionally guaranteed.

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discovery well, a gas-condensate producer from Oswego lime. The area is about 8 miles south of Hitchland.

Lohmann-Johnson Drilling Co., Evansville, Ind., has a new cable-tool operation in Crittenden County, western Kentucky. It is a McClosky test for Kennard Oil Co. at a wildcat location south of Marion.

Dillard & Waltermire Drilling Co., Houston, has scheduled a new 11,500-ft. wildcat test to be drilled for Continental Oil Co. at 1 Bel et al, in 28-8s-8w, about 3 miles north of Gillis field, in Calcasieu Parish, southwestern Louisiana.

Harvey Drilling Co. is contractor on a new wildcat test J. P. Owen, of Overton, Tex., is undertaking in Chandeleur Sound, off the east coast of St. Bernard Parish, Louisiana. Location is on State Lease 2293, in Block 70, Chandeleur Sound area. Permit is for 7,500 ft.

Peterson Drilling Co., Shreveport, has a new contract operation set up for the Pistol Ridge area, in Forrest County, southern Mississippi. It is a Wilcox test for Gaylord Container Corp. at 2 McCardle-Clark, in 18-1s-13w. Objective is expected at 5,000 ft.

Glasscock-Wilson, Inc., Shreveport, is scheduled for an 11,000-ft. test to be drilled for C. G. Glasscock and Tidelands Oil Co. 1½ miles east of the Rosedale area, in Iberville Parish, Louisiana Gulf Coast. The test will be drilled as 1 Angelloz. Spot location is in 41-7s-10e.

Long Brothers Drilling Co. has a new wildcat operation under way about 18 miles south of Mirando City, in Zapata County, in Texas' Rio Grande Valley. It is another contract job for McCabe & Turner at 3 R. Lopez Estate.

Grey Wolfe Drilling Co., Houston, has contracted for a 9,000-ft. test to be drilled for Christie, Mitchell & Mitchell, of Houston, on the east flank of Port Barre Dome, in St. Landry Parish, southern Louisiana. Location is listed as 1 Lucien Voorhies, spotted in 38-6s-6e. Projected depth should permit a look at Eocene sands.

Circle Drilling Co., Lake Charles, La., has a new contract job on tap for McGhee Production Co., of Dallas. It will be a 10,000-ft. test at 1 Danziger estate, in 19-10s-8e, in St. John the Baptist Parish, southern Louisiana. Location is on the west side of Lake Ponchartrain, 3 miles northeast of La-Place field, 25 miles northwest of New Orleans.

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Under Way, Contracted, and Planned

PIPELINE activity as reported below by The Oil and Gas Journal is compiled from information received from pipeline companies and contracting firms.

These projects include those planned, proposed, under way, and contracted. Uncontracted projects are indicated by • preceding the job.

Crude-Oil Pipelines

• **Big Horn Pipe Line Co.**—Firm has asked Wyoming Public Service Commission for permission to build a 150-mile, 8-in. crude-oil line from Ash Creek field, Wyoming, to a connection with Service Pipe Line Co.'s line at Midwest, Wyo.

Butte Pipe Line Co.—This jointly owned company of Shell Oil Co., Murphy Corp., and Northern Pacific Railroad has let contracts for its $18,000,000 crude-oil line from southeastern Montana to Guernsey, Wyo. Contractors and their spreads are:

Anderson Brothers Corp., Houston, 82 miles of 10-in. and 6½ miles of 12-in. from Glendive to Poplar, Mont.

Associated Pipe Line Contractors, Houston, sections 1 and 2, totalling 227 miles of 16-in. from the Montana-Wyoming state line to Guernsey.

O. R. Burden Construction Corp., Tulsa, 88 miles of 16-in. from Alzada, Mont., to Cabin Creek field near Baker. Company also has 15 miles of 12-in. in this area.

Art Hartwig, Inc.—Company will build and operate a 78-mile, 6-in. crude line from Sumatra field of central Montana to the Billings-Laurel refining area. The project will cost about $1,000,000 and will be finished by fall.

Interstate Oil Pipe Line Co.—Company has let contract to Sam Carline, Inc., of Berwick, La., to build 13 miles of 16-in. crude-oil line in the Raceland, La., district. Most of the line will be in Lafourche Parish. Completion is set for August 1.

• **Maico Pipeline, Inc.**—Company is planning a 40-mile, 4-in. line from South Blanco Tocito field in Rio Arriba County, New Mexico, to Bloomfield, San Juan County, New Mexico. Completion set for 1955.

Mid-Continent Pipe Line Co.—Company has let contract for 24 miles of 8-in. line from Hominy to Sand Springs, Okla. Trojan Construction Co., of Oklahoma City, is doing the work. Completion set for last of July.

• **Pasotex Pipe Line Co.**—Company will substitute 20-in. pipe on 70 miles of its two 8-in. lines from Wink to El Paso, Tex. The project will increase crude-oil deliveries to El Paso by 10,000 bbl. daily. After this job is finished, Pasotex could convert the remaining sections to 20-in. line to make 200,000 bbl daily available at El Paso. In an emergency, Pasotex could give enough crude to Southern Pacific Pipe Line Co. at El Paso to supply the West Coast until another crude line could be built.

Sinclair Pipe Line Co.—Morrison Contractors, Inc., is laying 31 miles of 12-in. for the company between Dayton and Sour Lake, Tex. Completion set for August 15.

• **Stanmount Pipeline Co.**—Company is seeking permission to build a crude-oil line from fields in North Dakota to Cromer, Man., where it would hook up with the Interprovincial line. The line would cost $6,000,000. Size not known.

Trans Mountain Pipe Line Co.—Engineers Limited Pipeline Co. has contract to lay 27 miles of 20-in. from Laurel to Burlington, Wash., and 9 miles of 16-in. of lateral to Shell Oil Co.'s new refinery at Anacortes, Wash. The $2,750,000 job will begin in spring and end July 31.

• **Union Oil Co. of California.**—Company proposes to build an 815-mile line from Rifle, Colo., to Los Angeles to carry the products from its proposed Rifle, Colo., shale-oil plant to the Los Angeles refining area. The line would cost approximately $56,000,000.

• **U. S. Defense Department.**—Defense officials are considering a 97-mile, $8,000,000 line from the Elk Hills Naval Reserve in California to the Los Angeles refining area.

• **West Coast Pipeline Co.**—The off-again-on-again plans for this crude line from near Wink in West Texas to near Norwalk in California are presently before the Office of Defense Mobilization. A three-man board of nonindustry members recently recommended that the project be dropped. They questioned the ability of West Texas to produce enough crude to supply both the East and West Coasts in time of war. The three-man board favored building a line from California's Elk Hills Naval Reserve to be held in standby for possible future need.

Products Pipelines

• **American Pipe Line Co.**—Has received ODM approval to amortize 40 per cent of $178,000,000 with a rapid writeoff on proposed line to run from Gulf Coast area to New York City area. Bids for pipe requested.

• **H. W. Bass & Sons, Inc.**—Company is planning on a 152-mile, 4-6-in. L.P.G. line from Goliad Corp.'s plant in Live Oak County, Texas, to Corpus Christi.

Buckeye Pipe Line Co.—Company is converting a crude line between Toledo and Cleveland to products service. Completion is set for October 1. Company is also laying 60 miles of 8-in. products line between Lima, Ohio, and Fort Wayne, Ind. Line will be completed by the end of the year. Firm also laying 14-mile, 10-in. crude carrier between Wayne, Mich., and Detroit.

• **California - Oregon Pipe Line System.**—103 miles 6-in., proposed, Crescent City, Calif., to Medford, Ore.

Champlin Refining Co.—River Construction Co. is laying 50 miles of 6-in. from the company's Enid, Okla., refinery to Ponca City, Okla. Job expected to be completed by August 1.

Great Lakes Pipe Line Co.—Company will let contract soon for 106 miles of 12-in. line between Des Moines and Iowa City, Iowa. The line will be finished by fall and will parallel existing 6 and 8-in. lines.

Keystone Pipe Line Co.—Sheehan Pipe Line Construction Co. is laying 49 miles of 8-in. for the company between Westchester and Allentown, Pa.

Southern Pacific Pipe Lines, Inc.—Company has completed letting most of the con-

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The electrical and mechanical design of Collins Microwave systems insure low maintenance costs and reduces equipment outages to the absolute minimum. All receiving type tubes are conservatively operated for maximum life. Industrial type metallic rectifiers together with magnetic-amplifier voltage regulators replace vacuum tubes in power supplies. A total of only four tube types reduce spare requirements. The IF amplifier employs fixed-tuned filters to provide a stable 14 mc passband with minimum alignment and maintenance. Built-in test facilities and fault sensing circuits simplify maintenance procedures. Mechanically-Filtered frequency division multiplex provides flexible channeling without complicated or critical circuitry.

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The plug-in IF unit, with nine fixed-tuned stages of amplification has a 14 mc bandwidth at half-power points (3 db down). Limiter bias, AGC voltage and discriminator balance may be monitored during operation. Under normal operation considerable change in tube transconductance can take place before affecting system operation.

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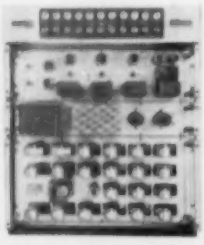
Single sideband suppressed carrier multiplexing is simplified and made economical by the use of Collins Mechanical Filter. The steep skirt attenuation permits use of upper and lower sidebands for transmission of two separate channels. The Filter is a small, permanently tuned, hermetically sealed unit. Deterioration of system performance caused by coil aging, humidity and other detrimental effects is eliminated.

Multiplex Test Panel

The facilities required for preventive and corrective maintenance of Collins Microwave system are built into the equipment. Facilities on the front panel of the RF unit provide tuning indications and overall performance checks. A test panel in the multiplex equipment provides signal source and level measuring facilities for general purpose testing and channel level setting.



System Fault Indicator

An optional fault locator system provides indication at the maintenance station of faults at any of the remote stations. Typical fault indications include switchover to standby, tower light failure, operation of stand-by power generator, fuel tank level and unauthorized entry. Fault indication for specific circuit outages are supplied to meet customer's maintenance requirements.

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Pipeline Patrol

tracts for its 846-mile products line from Los Angeles into Phoenix and El Paso into Phoenix. The contractors are:

...Schedule 1—158 miles of 8-in. between El Paso and Lordsburg, N. M., under construction by Morrison-Knudsen Co., Los Angeles, and River Construction Co., Fort Worth.

...Schedule 2—145 miles of 8-in. between Lordsburg and Tucson under construction by R. H. Fulton & Co., Lubbock, Tex.

...Schedule 3—122 miles of 8-in. and 35 miles of 12-in. from Tucson to Hassayampa, Ariz., contracted by Hood Construction Co., Lynwood, Calif.

...Schedule 4—128 miles of 12-in. from Hassayampa to Yuma, Ariz., let to Macco Corp. and Alex Roberson Co., Paramount, Calif.

...Schedules 5 and 6—197 miles of 12-in. between Yuma and Colton, Calif., let to Conyes Construction Co., San Pablo, Calif.

...Schedules 7 and 8—61 miles of 16-in. between Colton and the Watson, Calif., refining area not awarded yet.

• **International Pipe Line, Inc.**—132 miles, 8-in., proposed, Wrenshall to Minneapolis, Minn. Cost: $4,200,000.

Moore Stoner Co.—Company has $2,500,000 tax amortization for a 200-mile, 6-in. products line from a connection with Oil Basin Pipe Line Co.'s terminal at Glendive, Mont., to Minot, N. D.

Okan Pipe Line Co.—This subsidiary of Warren Petroleum Corp. has awarded work to two contractors for its L.P.G. line from western Oklahoma and Kansas to Tulsa. Vaughn & Taylor Construction Co. has 260 miles of 3 to 6-in. gathering lines, and R. H. Fulton has 140 miles of 6-in. transmission line from western Oklahoma into Tulsa.

Sioux Oil Co.—Company will build a 55-mile products, 8-in. line from its Newcastle, Wyo., refinery to Rapid City, S. D.

• **Sunflower Pipe Line System.**—Company proposes to build a 215-mile, 6-in. line to transport L.P.G. from six counties in western Kansas to Wichita. Application approved by Kansas Corporation Commission.

Texas Eastern Transmission Corp.—Company has received Federal Power Commission approval to abandon the "Little Inch" gas line and to convert it to products service. The company will spend $13,000,000 converting the line back to products. When finished the line will have a capacity of 235,000 bbl. daily.

Non-Petroleum Pipelines

American Gilsonite Co.—Company has announced plans for a 100-mile pipeline from near Bonanza, Utah, to a proposed gilsonite refinery in western Colorado. The company, owned by Barber Oil Corp. and Standard Oil Co. of California, plans to make gasoline and coke by refining gilsonite. The gilsonite would be moved in a slurry.

Pittsburgh Consolidation Coal Co.—This firm has announced plans for the first pipeline to move coal. The line will be 108 miles of 10-in. from the company's Georgetown mines in eastern Ohio to Cleveland Electric Illuminating Co.'s Eastlake power plant northeast of Cleveland. Construction will start this fall as soon as right-of-way can be procured. Ford, Bacon & Davis, Inc., will issue specifications, let contracts, and supervise the construction work.

Natural-Gas Pipelines

• **Alabama-Tennessee Natural Gas Co.**—Company has proposal before FPC to lay 21 miles of 12-in. line west from its present line in Colbert County, Alabama.

American Louisiana Pipe Line Co.—Com-

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Pipeline Patrol

pany has let the bulk of its 1,121 miles of natural-gas line from North Tepetate, La., to Detroit. H. C. Price Co., Bartlesville, Okla., and Houston Contracting Co., Houston, were awarded 783 miles of 30-in. Brown & Root, Inc., Houston, was awarded approximately 221 miles of 30-in. from North Tepetate to the Arkansas-Louisiana border. The only section not awarded is a 22-in. spur from Payne, Ind., to Bridgman, Mich. Price will have two spreads in the field. One will work south from the Hancock-Henry county line in Indiana, the other will work north from Slaughters, Ky. Houston Contracting will also work two spreads. One will start working south from Detroit and the other north from the Hancock-Henry county line.

Atlantic Seaboard Corp.—Company has let 82 miles of 26-in. gas line in Virginia, West Virginia, and Maryland. Pipe Line Construction & Drilling Co., Lemoyne, Pa., has 32 miles in three sections. Williams-Austin Co., Pittsburgh, has 40 miles in West Virginia. Job set for completion the last of August.

• **Carolina Natural Gas Corp.**—185 miles 2-12-in., proposed lateral lines off Transcontinental in North and South Carolina.

• **Central Hudson Gas & Electric Corp.**—Company has filed application with FPC to construct 48 miles of 12-in. line from Albany to Kingston, N. Y. Line will be started and completed in 1955 if FPC approves.

• **Cities of Clarendon and Marvell, Ark.**—Cities have filed for FPC permission to interconnect their facilities with Texas Gas Corp.'s line south of Helena, Ark. The cities will build 53 miles of 4, 5, and 6-in. line to transport the gas.

• **Cities Service Gas Co.**—Company has applied to the Federal Power Commission for permission to build a 93-mile, 26-in. natural-gas line from Blackwell, Okla., to Independence, Kans. The company also proposes to build a 145-mile gathering system in Woods County, Oklahoma, and Barber County, Kansas. The two jobs will cost $8,422,400.

• Company is also seeking FPC authority to remove 41 miles of line and to construct 39 miles as replacement in Newton, Lawrence, Lafayette, and Johnson counties, Missouri, and Johnson County, Kansas. The projects will cost $1,685,000.

• **Coastal Transmission Co.**—Company plans to build 550 miles of 30-in. line from near McAllen in South Texas to near Baton Rouge (See Houston, Texas Gas & Oil Co.)

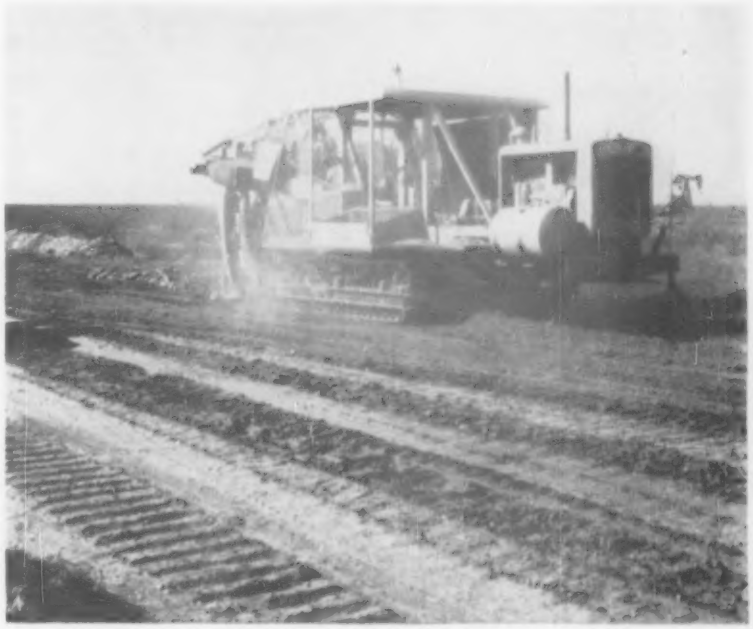
Colorado Interstate Gas Co.—Company has let first part of its 380-mile, 22-in. line from Rock Springs, Wyo., to Denver to Houston Contracting Co. The construction firm is working on 126 miles from near Laramie, Wyo., to Denver. The line will pick up its gas from Pacific Northwest at Rock Springs.

Colorado Interstate Gas Co.—Company is also spending $4,200,000 extending its gathering lines in the Panhandle of Texas, Oklahoma, and Kansas. Work will be done this summer.

• **Colorado-Western Pipe Line Co.**—454 miles of undetermined size pipe planned between Cortez in Montezuma County and Denver. Line would serve towns of Montrose, Gunnison, Salida, Fairplay, and South Platte, Colo. Estimated cost: $30,000,000. Company also plans 254 miles of laterals to service Colorado cities not now receiving natural gas.

328-mile line, proposed, to run from a point in La Plata County in southwestern Colorado over the Continental Divide along the eastern slope to serve Pueblo, Colorado Springs, and Denver. Estimated cost: $21,600,000.

• **Colorado-Wyoming Gas Co.**—Company has application before FPC to build approximately 20 miles of 4 to 16-in. line in



Cleveland "320" licks Ector County rock on recent Pioneer Gas line in Texas

As most pipeliners know, Ector County, Texas is in a class by itself when it comes to tough digging. Yet this Cleveland "320"—one of many owned by R. H. Fulton Construction Company of Lubbock, Texas—stayed right on schedule as it dug through 50 miles of Ector County's almost solid rock. This job for Pioneer Gas also points up the "320's" ability to dig smaller diameter lines economically, as well as the bigger-inch lines on which it is so widely employed.

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Pipeline Patrol

the suburbs of Denver. The facilities will cost about $581,000.

East Ohio Gas Co.—Company has let contract to Williams Brothers Co. to lay 112 miles of 30-in. from Maumee, Ohio, to Cleveland. Completion is set for October 1.

• **El Paso Natural Gas Co.**—Company has three plans ready to present to the FPC to increase its California capacity. The preferred plan calls for the company to loop its 500-mile, 30-in. line from the San Juan basin to the California border with a 34-in. line. If this fails to win approval, the firm will offer to build a 30-in. line from Pacific Northwest's line at Mountain Home, Idaho, to the San Francisco area. Another plan is to build a 30-in. line from near Pendleton, Ore., into California. Company feels the looping program will be required even if one of the alternate plans would win approval.

Gas Service Co.—Company is spending $216,000 building a 14-mile, 12-in. gas line from Kansas City to the new Mid-Continent International Airport there.

• **Houston, Texas Gas & Oil Co.**—Company plans to build 600 miles of 30-in., and 150 miles of 18-24-in. line to carry natural gas from Baton Rouge to Miami. Line will join with Coastal Transmission's proposed line from McAllen, Tex.

Kansas-Nebraska Natural Gas Co., Inc.—Company is presently laying 53 miles of 4, 6, 8, and 10-in. gathering lines in the Hugoton, Guymon, Unruh and fields in Kansas and Oklahoma, and in the Denver-Julesburg basin in Colorado. Sterling Construction Co., Sterling, Colo., Brodie Contsruction Co., Amarillo, Tex., Cheek Construction Co., Ulysses, Kans., and L. F. Nichols Construction Co., Great Bend, Kans., are doing the work. Nichols also is laying 9 miles of 2-in. between Cairo and Henderson, Nebr. Sterling also has 14 miles of 2, 3, and 4-in. around Otis and Yuma, Colo. Brodie Construction also has contract for 37 miles of 4 and 6-in. gathering lines in the Denver-Julesburg basin. Kansas-Nebraska also is taking bids on 10 miles of 12-in. transmission around Webster, Kans. Thirty-seven miles of 3 and 4-in. transmission line around Tribune, Kans., and Kimball, Nebr., is awaiting approval.

• **Kentucky West Virginia Gas Co.**—Firm has FPC permission to construct 32 miles of line to connect with a line to be built by Clinchfield Coal Corp. near Osborne Gap, Ky. The line will extend to Kentucky West Virginia's existing system near Maytown, Ky. The Clinchfield job will cost $785,000. The Kentucky West Virginia work will cost $1,455,000.

• **Lone Star Gas Co.**—Company has two plans up before FPC to enlarge its system in Texas and Oklahoma. One is for an $18,000,000, 230-mile line from Cotton County, Oklahoma, to Fritch, Tex. The other plan is for a 205-mile line from Snyder, Tex., to a hookup with the Cotton-Fritch line. The company hopes to prevent Natural Gas Pipeline Co. of America from building its line from Wise County, Texas, to Fritch (see below).

• **Michigan Consolidated Gas Co.**—25 miles, 12-in., proposed, from near Sparta to Muskegon, Mich.

Michigan Gas Storage Co.—Bechtel Corp. has contract to build 36 miles of 16-in. line from Mount Pleasant Junction to Milwaukee, Mich. The line will cost $2,500,000. Bechtel has set October 15 as completion date.

• **Michigan Wisconsin Pipe Line Co.**—251 miles, proposed, 24, 18, 12, 6, and 4-in. loops. Majority will be in Wisconsin.

• **Montana-Dakota Utilities Co.**—Company has applied to FPC for authority to construct 44 miles of pipeline and 1,090 hp. in compressor capacity on its system in South Dakota and Wyoming. Estimated cost would be $1,414,218.

• **Natural Gas Storage Co. of Illinois**—Company has asked FPC authority to build 31 miles of 36-in. line from its storage field in Kankakee and Iroquois counties, Illinois, to a connection with Texas Illinois Natural Gas Pipeline Co.'s line where it crosses the Illinois River.

• **Natural Gas Pipeline Co. of America.**—Company now before FPC on plans to build 350 miles of 20 and 26-in. line from Wise County, East Texas, to its station 111 at Fritch, Tex.

Nevada Natural Gas Co.—Company plans looping program along its 114-mile line from Needles, Calif., to Las Vegas, Nev. Mileage and size are unknown but cost will be about $2,500,000.

• **New River Gas Co.**—50 miles, planned, Summers to Monroe counties, West Virginia, to Narrows and Dublin, Va.

• **New York State Natural Gas Corp.**—Company has FPC permission to lay 21 miles of 20-in. line from Genesee Falls, Wyoming County, New York, to York, Livingston County, New York. FPC permission was received the last of June. Work should start in July and wind up in August.

• **Niagara Mohawk Power Corp.**—Company plans no major transmission lines for 1955. However, itp lans to add more than 300 miles of distribution mains.

• **Northern Natural Gas Co.**—Company has cancelled its 1955 construction program listed below until 1956 due to Trans-Canada Pipe Lines, Ltd., being delayed in starting its line. The program, which is now set for 1956, included:

• Canadian Extension—188 miles of 24-in. from Canadian border to near Wahpeton, N. D. 215 miles of 30-in. from Wahpeton to Farmington, Minn.

• South Dakota Extension—94 miles of 12-in. from Sioux Falls to Watertown-Huron.

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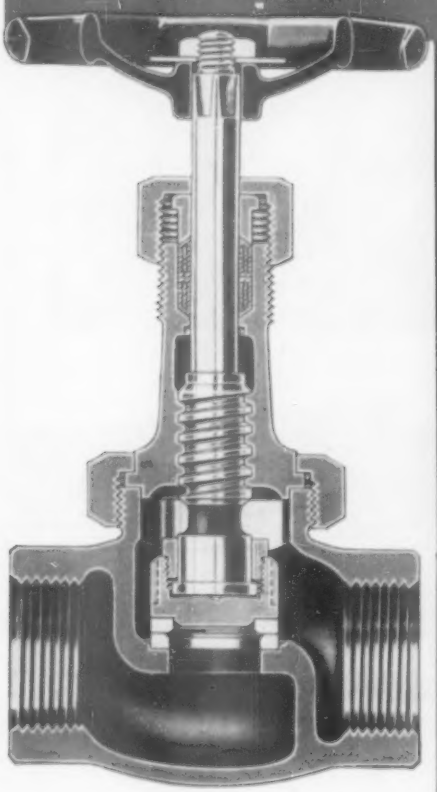

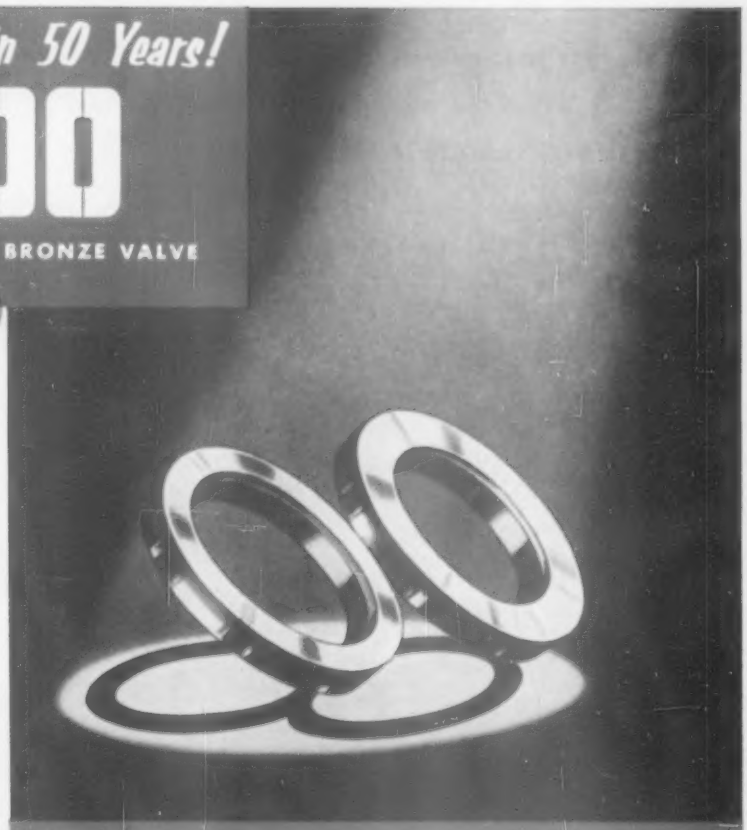

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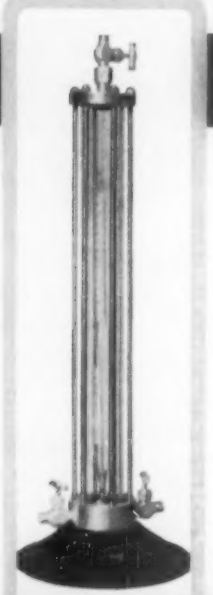

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Pipeline Patrol

71 miles of 10-in. from Watertown-Huron to Duluth-Superior.

• Duluth-Superior Extension—167 miles of 24-in. from Farmington to Duluth-Superior.

• Company has also asked FPC permission to build and operate $4,800,000 worth of pipeline facilities for use in testing an underground natural-gas storage field near Redfield, Iowa. The project would involve construction of 29 miles of 30-in. pipe.

• **Ohio Fuel Gas Co.**—Firm has applied for FPC permission to build 19 miles of 16-in. line in Hardin and Allen counties, Ohio, partially looping an existing line.

Pacific Gas & Electric Co.—Company is working on 18 miles of 12-in. from Beehive Bend field to W/O Gridley in California. The job is slated for completion in September.

• Company plans 21 miles of 16-in. line from Marysville to Lincoln, Calif. Job will start in June and wind up in September.

• Company's long-range plans call for looping the Topock-Milpitas line with 135 miles of 34-in. The major part of the line will be laid in 1956, while 62 miles will be laid in 1957.

Pacific Northwest Pipe Line Corp.—Firm has let the initial contracts of its 1,466 miles gas line from the San Juan basin to Bellingham, Wash. The first contracts total $11,236,000. Contractors and their sections are:

River Construction Co., two sections totalling 150 miles of 26-in. between Ignacio, Colo., and Moab, Utah.

R. H. Fulton Co., two sections totalling 160 miles of 26-in. between Moab and Jensen, Utah.

Associated Pipeline Contractors, Inc., one section of 77.6 miles of 26-in. between Jensen and Green River, Wyo.

A. J. Curtis Construction Co., one section of 82.8 miles of 22-in. from Green River to Sage, Wyo.

B & M Construction Corp., one section of 90 miles of 22-in. between Sage and Lava Hot Springs, Idaho.

Midwestern Constructors, Inc., one section of 95 miles of 22-in. from Lava Hot Springs to Burley, Idaho.

H. B. Zachry Co., San Antonio, sections 9 and 10, 214 miles of 22-in. between Burley and Payette, Idaho.

Fulghum Construction Co., Harrisburg, Pa., sections 11 and 12, 198 miles of 22-in. between Payette and the Columbia River at the Oregon-Washington border.

A. J. Curtis Construction Co., Casper, section 26, 54 miles of 16-in. laterals and 31 miles of gathering-system lines from a point on the main line near Kemmerer, Wyo., to Big Piney field, Wyoming.

R. H. Fulton, Lubbock, section 27, 43 miles of lateral lines and 16 miles of gathering lines from Rangely, Colo., to Piceance Creek field, Colorado.

• **Panhandle Eastern Pipe Line Co.**—Company has plans to loop Peoria lateral before FPC now. The line would be 16-in. pipe running 58 miles from near Springfield to Peoria, Ill.

• **Pine Tree Natural Gas Co.**—204 miles of undetermined size pipe to run from the Boston area to Bangor, Me.

Private Interests.—Proposes to build gas line from Gubik gas field near Navy Petroleum Reserve No. 4 in Alaska to Fairbanks. Line would be 450-mile, 8-in. line and Arctic Contractor, Inc., who handled engineering requirements and preliminary design, estimated the line would cost $20,000,000, although later figures have been much higher than this.

Tennessee Gas Transmission Corp.—Company is carrying out a large expansion program in New York, Pennsylvania, New Jersey, and Ohio. Oklahoma Pipe Line Constructors is working on 113 miles of 24-in. line from Covington to Laska-Waxen, Pa. Bechtel Corp. has lines for the company in New Jersey, and Pennsylvania. H. C. Price Co. has 130 miles of 24 and 26-in. in Ohio and Pennsylvania.

The company has FPC approval for 370 miles of 30-in. from Agua Dulce, Tex., to Kinder, La. The line will cost $35,400,000.

The first has also requested FPC permission to spend $56,000,000 in new pipeline and compressor facilities. The work will include 221 miles of 26 and 30-in. loops in Ohio and Kentucky and 376 miles of gathering lines in Louisiana and Texas. Some 12,450 hp. would be added in new and existing compresser stations in Texas, Louisiana, and Mississippi.

Texas Eastern Transmission Co.—Company has received FPC permission to begin converting its Little Inch line from natural gas to products service. Company has also proposed to Mobilization Director Arthur S. Flemming that the Government give it accelerated amortization on money to invest to put the Big Inch line on standby product service. The company's program is:

. . . To convert the Little Inch to products with a capacity of 235,000 bbl. daily and to install enough standby pumping equipment to hike the capacity to 375,000 bbl. daily if needed.

. . . To install standby pumping equipment along the Big Inch that would allow the line to be converted from gas to products in an emergency. The line would have a capacity of 425,000 bbl. daily.

. . . To build a 382-mile, 30-in. natural-gas line from Beaumont to Kosciusko, Miss., to connect with an existing 30-in. line running to Connelsville, Pa.

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Contracts for this line have been let as follows:

Houston Contracting Co., Houston, 59 miles from near Beaumont to 12 miles east of DeQuincy, La.

Tulsa Williams Co., Tulsa, 118 miles from 12 miles east of DeQuincy to a point on the west side of the Mississippi River near New Roads, La.

H. C. Price Co., Bartlesville, Okla., 134 miles from near New Roads to 2 miles southeast of Clinton, Miss.

H. B. Zachry Co., San Antonio, 64 miles from Clinton to near Kosciusko, Miss.

The Texas Eastern proposal clashes with a plan of American Pipe Line Co. to build a line from the Gulf Coast to New Jersey (See table under products).

Texas Gas Transmission Corp.—Company has big building program set to start soon and end approximately November 1.

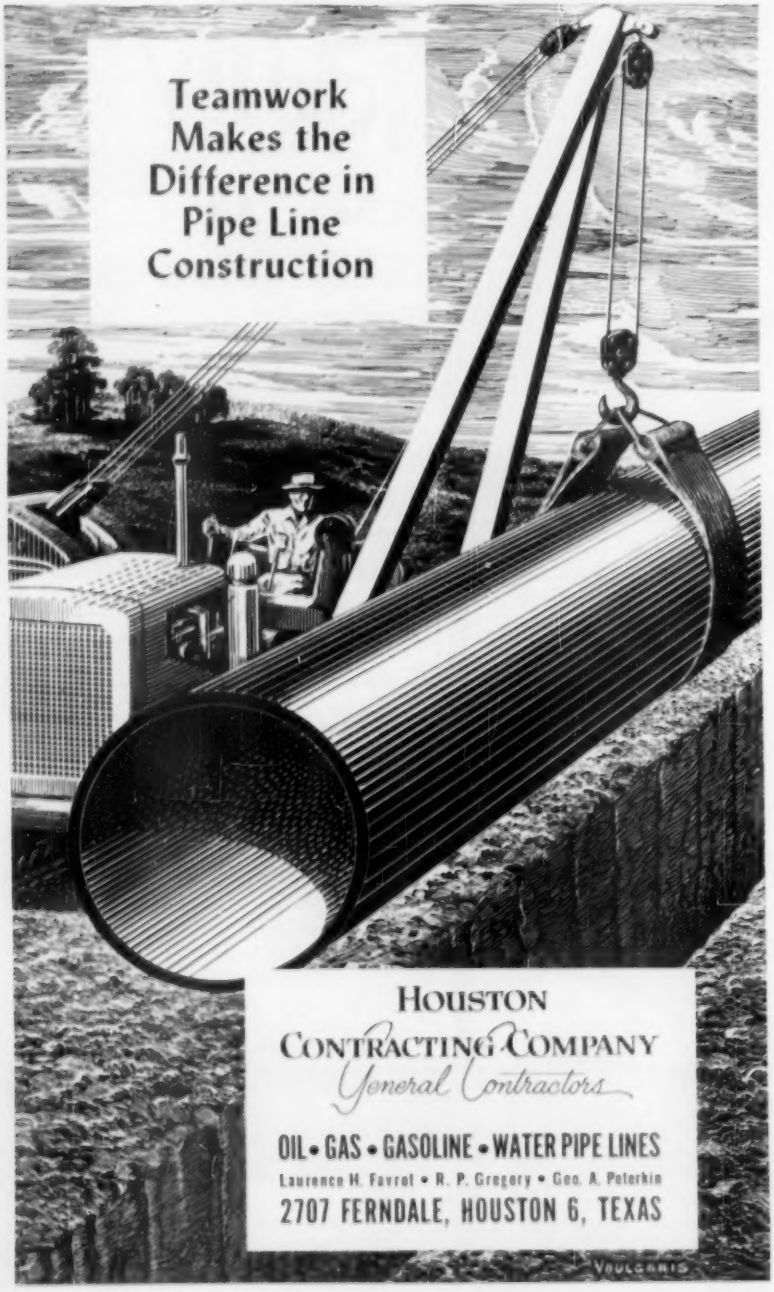
From Covington, Ky., to Jefferstown, Ky., company will build 77 miles of 26-in. H. C. Price Co.

Company will loop 14 miles of 20-in. at Haughton, La. Houston Contracting Co.

Will build 72 miles of 12-in. from Hardinsburg, Ky., to Bedford, Ind. Also will build 5 miles of 8-in. near Bedfoard. H. C. Price.

From Bastrop, La. to Clarksdale, Miss., the company will lay 50 miles of 30-in. H. C. Price.

From Eunice, La., to Morgan City, La., the firm will lay 105 miles of 20-in. H. C. Price.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• Company has also filed with the FPC for permission to add 198 miles of line and an additional 20,270 hp. in compressor capacity along the route of its system in Louisiana, Arkansas, Mississippi, Tennessee, Kentucky, and Indiana. The project will cost $20,000,000.

Transcontinental Gas Pipe Line Corp.—Company has awarded the following contracts to lay 315 miles of 36-in. and 219 miles of 30-in.

Associated Pipe Line Contractors, Inc., will lay 63 miles of 36-in. in Louisiana and Mississippi and 71 miles of 30-in. in Virginia and Maryland.

Midwestern Constructors, Inc., will lay 14 miles of 30-in and 54 miles of 36-in. in Alabama and Georgia.

Western Constructors will lay 77 miles of 36-in. in Georgia and South Carolina.

Panama-Williams Co. will lay 36 miles of 30-in. and 31 miles of 36-in. in South Carolina and North Carolina.

Williams Brothers Co. will lay 72 miles of 30-in. in Virginia.

• Company has received FPC examiner approval to build 24 miles of line in South Bayou Mallet, Maxie, and Happytown fields in Louisiana to gather gas for movement in its interstate lines.

Transok Pipe Line Co.—Company has let contract to Pipe Line Service Co., Seminole, Okla., to lay a 140-mile, 24-in. line from Garvin County, Oklahoma, to Tulsa. The firm will also build a gathering system in the Bradley, West Lindsay, and Northwest Purdy fields.

• **Trunkline Gas Co.**—Firm has applied to FPC for authority to build eight new compressor stations and 24 miles of pipeline on its transmission system to enable it to sell additional gas to Panhandle Eastern Pipe Line Co. Total capacity of the new stations would be 56,000 hp. Total cost would be $18,700,000, including $1,000,000 for gathering facilities in the Gulf Coast area. Panhandle filed for 1,600 hp. additional compressor capacity to cost $3,714,000.

• **United Gas Pipe Line Co.**—Company has applied to FPC for permission to construct 63 miles of 16 and 20-in. natural-gas line in Mississippi, Alabama, and Florida. The company will also add 330 hp. to its compressor stations. Cost for the job will be about $8,300,000.

• **Utah Natural Gas Co.**—Planning 40 miles from Orem to Salt Lake City, 16-in. pipe at later date. Contract not yet let.

• **Washington Gas Light Co.**—Company seeks FPC permission to build 11 miles of 24-in. natural-gas line from its Chillum station in Maryland via its East station in the District of Columbia to Gordon's Corner, Md. The line will also cross the Anacostia River. Cost is estimated at $2,000,000.

Foreign Crude-Oil Pipelines

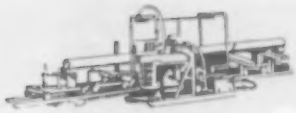
• **Atlas-Dresser.**—Included in this company's agreement with the Argentine Government are plans to build a 400-mile, 16-in. crude line from Plaza Huincul area to Bahio Blanca.

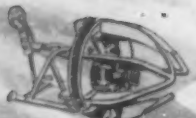
Bolivian Government—Williams Brothers has contract to build a 220-mile, 6-in. crude-products line from Cochabamba to Orura to La Paz. The line is described completely in The Oil and Gas Journal of May 16, 1955, page 136.

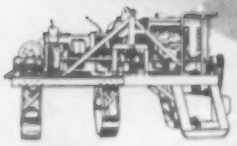
Canadian Gulf Pipe Line Co.—Williams Brothers has contract to build 17 miles of 4-in. and 36 miles of 6-in. for this company from Clive and Joffre fields to its connections at Stettler.

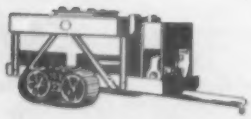
• **Cremona Pipe Line Co.**—Firm has announced plans for a 60-mile crude-oil line from the Westward Ho-Sundre area to Calgary.

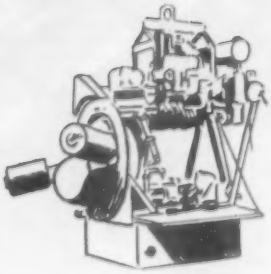
Peace River Oil Pipe Line Co., Ltd.—Fulton-Banister, Ltd., has contract for 106-mile











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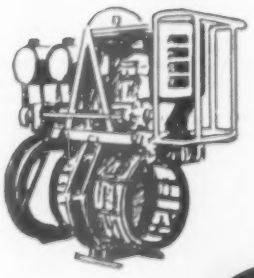

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Pipeline Patrol

line from Sturgeon Lake field in Northwest Alberta to the Edson pumping station of Trans Mountain Oil Pipe Line Co., Ltd. The project includes 41 miles of 16-in. and 65 miles of 12-in. Completion is set for October 1.

Pembina Pipe Line, Ltd.—Company has let approximately 400 miles of gathering lines in Pembina field to Hupp, Ltd. Work began last year and will be completed in November 1955.

• **S & M Pipeline, Ltd., and Westspur Pipeline Co.**—Former company is a subsidiary of Canadian Devonian Petroleums, Ltd., and proposes to build a 100-mile crude line from southeastern Saskatchewan to the Interprovincial Pipeline Co. line at Cromer, Man. Westspur, a subsidiary of Imperial Oil, Ltd., proposes to build the same line. Another company, Trans Prairie Pipe Lines, Ltd., also is seeking a permit to build a similar line.

Yacimientos Petroliferos Fiscales Bolivianos—Williams Brothers has contract to build a 230-mile, 6-in. products line from Cochabamba-Oruro-La Paz. The line will cost approximately $7,000,000. The Bolivian Government will eventually add a 10-in. products line from Oruro to Arica, Chile.

Foreign Products Pipelines

• **National Fuel Oil Co.**—This company in Israel is a shareholder in a company which plans to build a products line between Haifa and Tel Aviv. The plans call for a 55-mile 6-in. line in which the Government would own 10 per cent.

• **National Iranian Oil Co.**—Company plans $32,300,000, 573-miles, 10-in. products pipeline from Ahwaz to Teheran, Iran. The line will have a capacity of 40,000 bbl. daily. Costain-John Brown, Ltd., London, will build the 337-mile southern part. Entrepose, Paris, will build the northern 236 miles.

• **Sinclair Oil Corp.**—Company is considering a 240-mile crude-oil line from its San Silvestre field in the state of Barinas, Venezuela, to Puerto Cabello on the Caribbean Sea coast. The line would cost $25,000,000.

• **United States Government.**—375 miles, 12-in., planned, St. Nazaire to Melun and Metz, France.

U. S. Defense Department.—U. S. Defense Department is sponsoring a 485-mile, 8, 10, 12-in. products line from Cadiz to Zaragoza, Spain. The contract has been let to Merritt, Chapman & Scott; Benson & Root, of Oklahoma City; and Agroman Construction Co., a Spanish firm. Brown-Raymond-Walsh is the prime contractor. Cost of the line will be approximately $5,000,000.

Foreign Natural-Gas Pipelines

Alberta Gas Trunk Line, Ltd.—This Canadian firm has let engineering contracts to two firms, Dutton, Williams Brothers, Ltd., and Mannix, Ltd., for a 300-mile, big inch gas-gathering system to collect Alberta's natural gas for transportation to Trans Canada Pipe Line Co.

Attock Oil Co.—Company plans to build 60-mile natural gas pipeline from Dhulian field to Rawalpindi in West Pakistan.

• **Canadian Western Natural Gas Co.**—Firm will begin work this spring on a $1,000,000, 59-mile natural-gas project in southern Alberta. The company will also add a compressor station at Lethridge, Alta.

• **Empresa Nacional del Petroleo.**—80 miles, 10-in., planned, Concon to Santiago, Chile.

• **North Canadian Oils, Ltd.**—Company will lay 136 miles of 10-in. line from Wabumun to Hinton, Alta. The gas will be sold to a pulp mill at Hinton. Mid-Western Industrial Gas, Ltd., which will supply the gas along with North Canadian, will build a line from its gas fields in the Alexander, Majeau Lake, and Westlock districts to Wabumun.

South Alberta Pipe Line, Ltd.—Company has filed permit to construct a 150-mile, 8-in. natural-gas line from Etzikom field to serve a nitrochemical plant to be built near Medicine Hat, Alta. The line will cost about $1,000,000.

Trans-Canada Pipe Lines, Ltd.—Company has postponed start of 2,250 miles of 24-34-in. line from Alberta-Saskatchewan border to Toronto and Montreal until next year because of financing difficulties. Company also plans a 24-in. lateral from Winnipeg to Emerson, Man. Twenty-inch lateral from Niagra to Toronto now in operation. Plans for line to enter U. S. may be considered.

Saskatchewan Power Corp.—Company has let contract to Majestic Contractors, Ltd., Edmonton, for a 226-mile natural-gas pipeline from Coleville to Prince Albert. The line from Coleville to Saskatoon will be 116 miles of 14-in. From Saskatoon to Prince Albert, the line will include 40 miles of 12-in. and 70 miles of 10-in. Banister Construction, Ltd., has the distribution system for Prince Albert.

• **Sui Transmission Co.**—Firm is considering a second natural-gas line in Pakistan. This line would run 400 miles from the Sui gas fields to Lahore. The cost would be about $30,000,000.

• **Westcoast Transmission Co., Ltd.**—Company has signed agreement with Pacific Northwest Pipeline Corp. and has revived plans for its line from the Peace River area of Alberta and British Columbia to the United States border near Sumas, Wash. Plans call for work to begin sometime this year. Company has also announced plans for a second line to parallel the first and to swing east into the Okanagan Valley.

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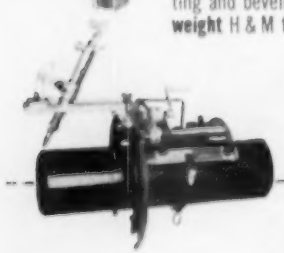

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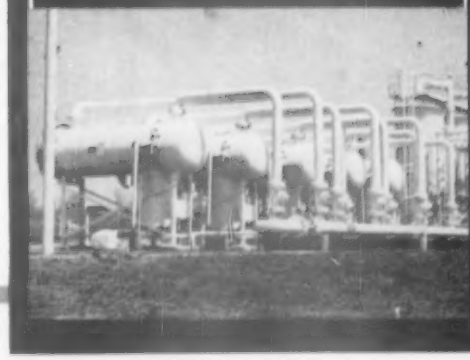

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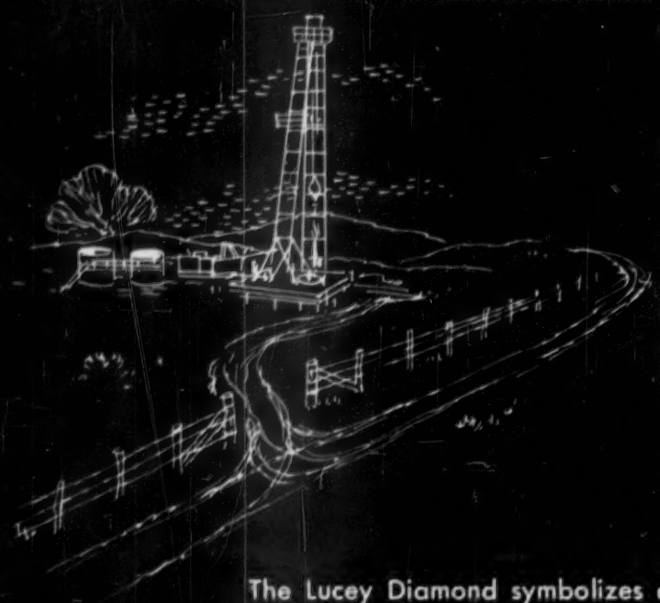

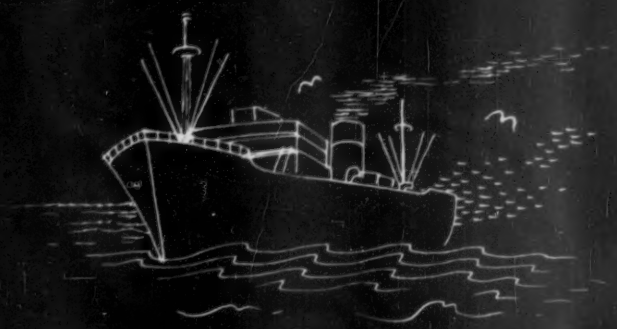

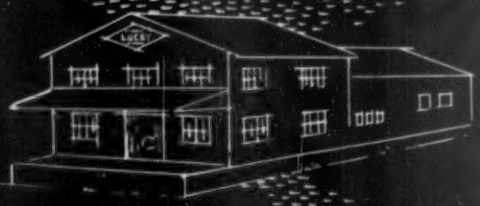

The Lucey Diamond symbolizes an organization that is versatile and aggressive, known especially for its ability to perform unusual services tailored to specific situations.

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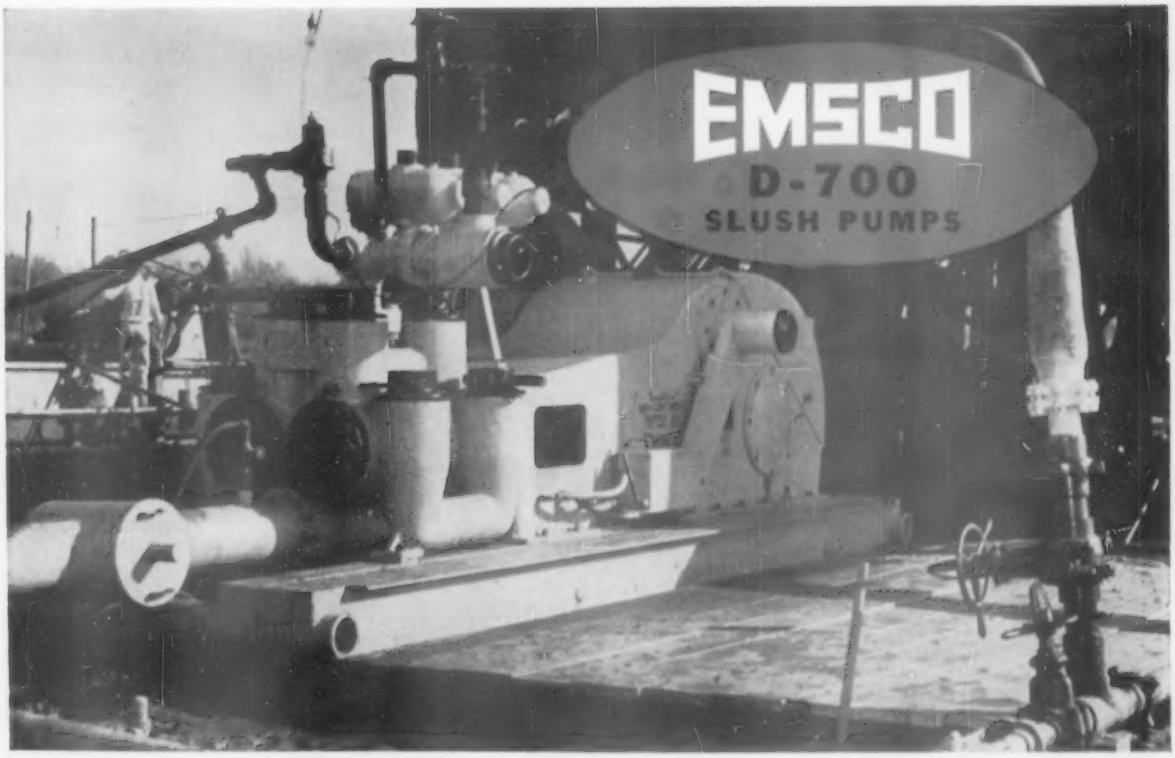

Pace-setting Performance...for Jet Bit, Big Hole and Deep Drilling

PESA
PARTNERS IN PETROLEUM PROGRESS

For complete information on Emsco Pumps for every drilling requirement, contact your nearest Mid-Continent store or representative.

With the Emsco D-700, it is usually unnecessary to parallel (or compound) pumps to get mud volumes and pressures needed for jet bit, big hole and deep drilling. This pump is designed to meet specialized mud circulating requirements and incorporates all the features which have made Emsco pumps famous for dependable performance and low-cost operation.

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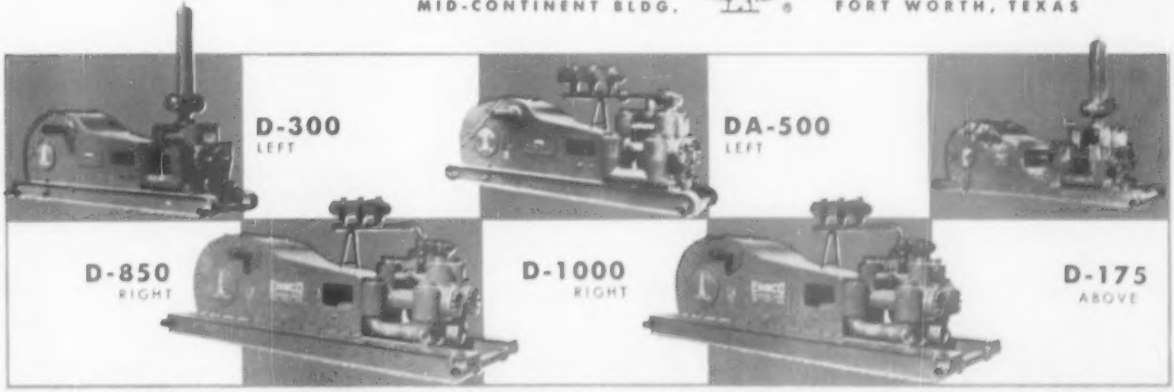
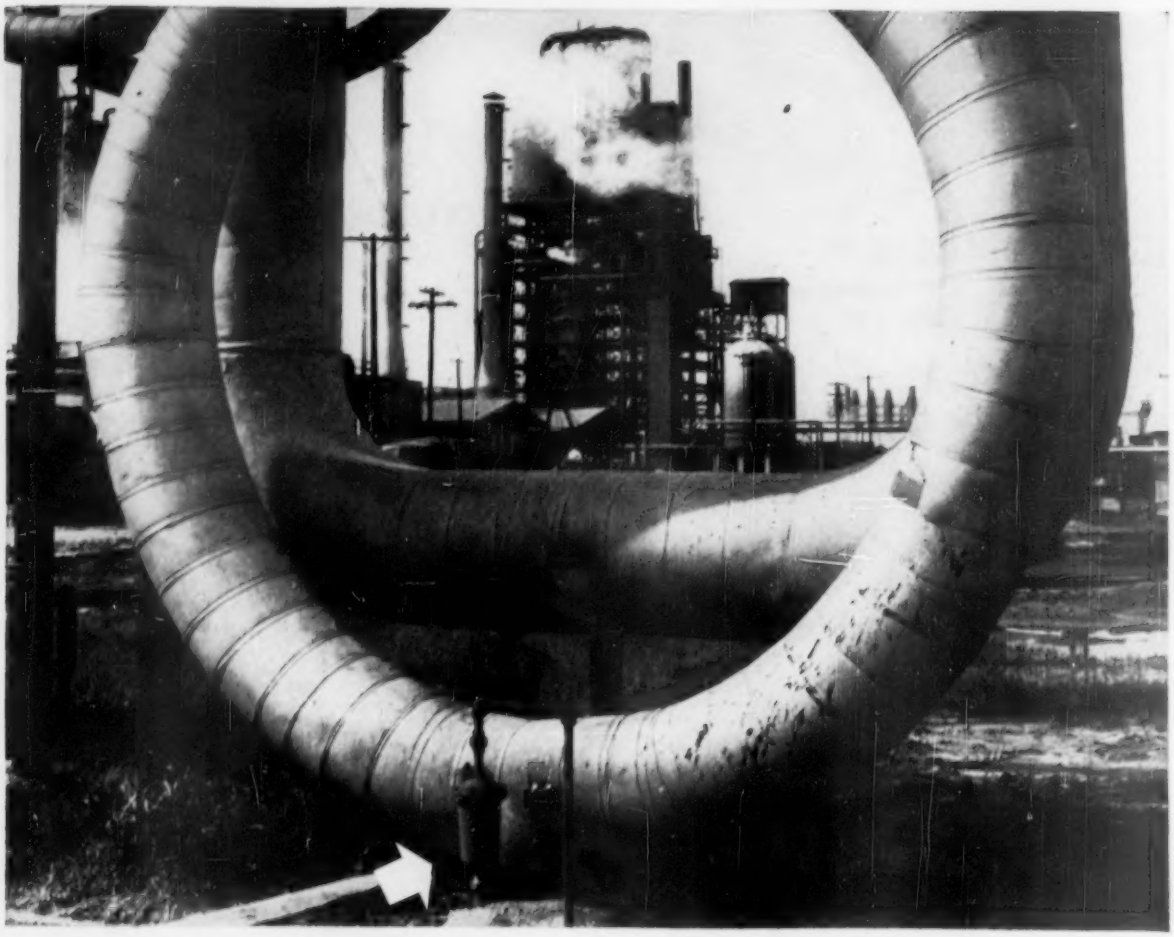


THE WORLD'S LARGEST INDEPENDENT OIL FIELD SUPPLY COMPANY



Look Ahead When You Specify Steam Traps...

100 or 1,000 or 10,000 steam traps in a plant are a small item in relation to the processing equipment that depends upon them. But if they are troublesome, headaches are just multiplied by the number in use. It hardly pays, then, to be pennywise in specifying traps.

Perhaps the biggest single consideration in choice of traps should be their long-range performance. Look ahead—will the traps do the job? Will they stand up? Will they require frequent maintenance?

No traps in the world have ever turned in better performance records than Armstrongs. And, here is why:

Design—simple...only two moving parts . . . "frictionless" free-floating leverage . . . heavily reinforced for wear . . . generous safety margins.

Materials—file-hard chrome steel valve and seat, hardened, ground and lapped together. All other parts corrosion-resistant stainless.

Experience—designed and built by men with more inverted bucket trap experience than any other organization.

Inspection—quality control is not by sampling—*every trap* is tested before shipment.

Guarantee—satisfaction or your money back.

When you specify Armstrong traps you can look ahead to long, long trap life with infrequent maintenance. Ask your Armstrong Representative to give you details or write:

ARMSTRONG MACHINE WORKS
868 Maple Street, Three Rivers, Michigan

Application Engineered
ARMSTRONG STEAM TRAPS

ASK FOR STEAM TRAP BOOK

. . . 44 pages of practical data designed to give you better trapping. Free on request . . . no obligation.

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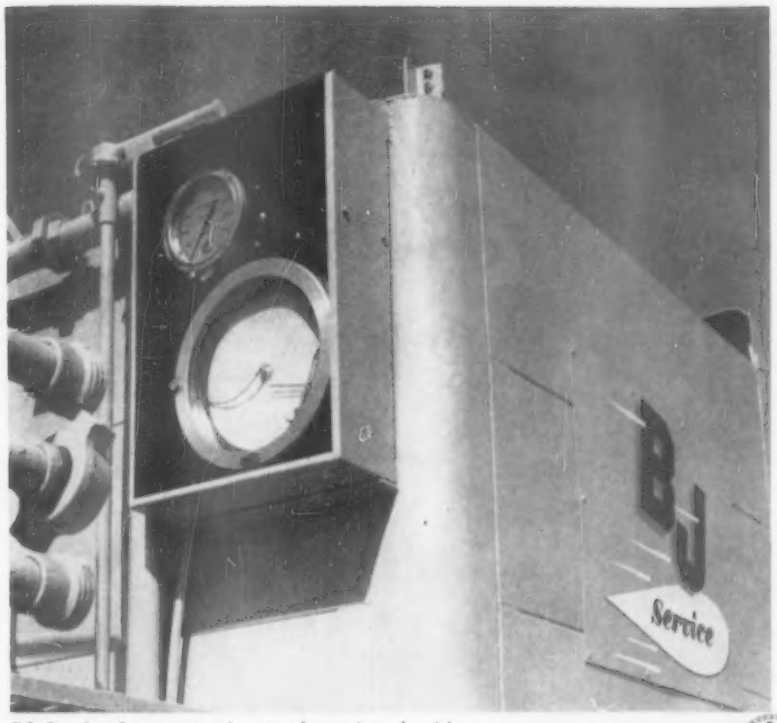

BJ Service Inc. cementing truck equipped with a Martin-Decker M-218 pressure indicator with a single-pressure-system, two-pen recorder.

The greatest names in oilwell service depend on the greatest name in oilwell instrumentation.

MARTIN-DECKER CORP.
HOME OF THE WEIGHT INDICATOR — LONG BEACH, CALIFORNIA

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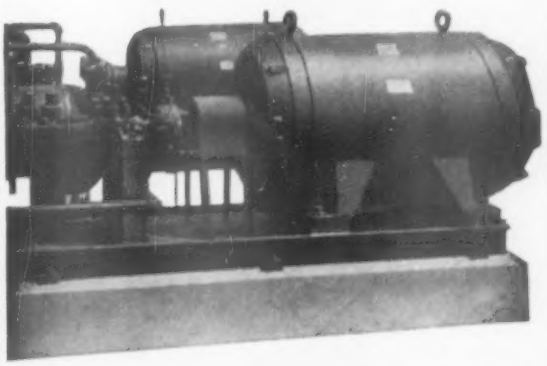

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PLANTS:
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PHOENIX *Drop-Forged* FLANGES
MEAN . . .
MAXIMUM STRENGTH

Long life is assured with Phoenix maximum strength flanges. Forged of mild steel, they are available in a wide range of styles and sizes. Meet ASA requirements and ASME and ASTM specifications.

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Send for free brochure showing Phoenix Complete Line.

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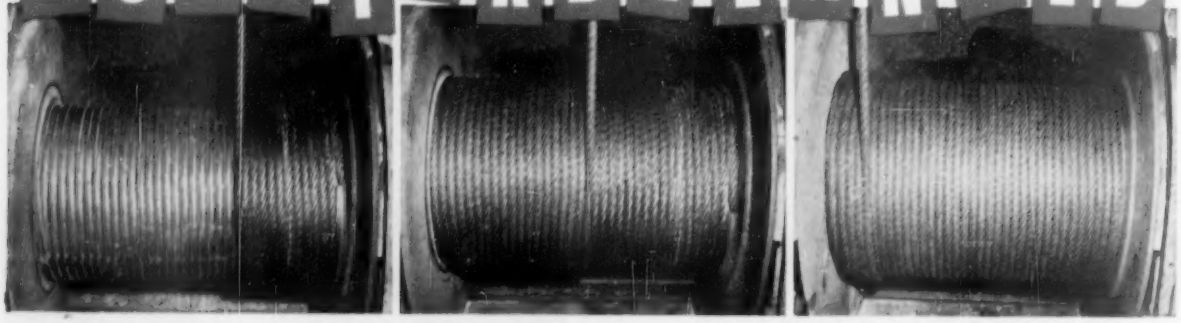

Note that less line is needed at pick-up position on LeBus Grooved Drum. Plain drums usually require a layer and a half of line up to the pick-up point.

The line is crossing over in this photo as the line reaches the middle of second layer. Notice even spooling.

The line has reached the fourth layer and is still spooling smoothly and evenly onto the LeBus Grooved drum.

LEBUS GROOVING & COUNTERBALANCE CONTROL PYRAMID SPOOLING SYSTEM

Consult a LeBus Engineer for details or write

Just as Scientists have attained "perfect balance" and "smooth running" of a gyroscope so has LeBus Engineered their Grooving and Spooling System for "perfect balance" and "smoother operation." With the LeBus GROOVING AND COUNTERBALANCE CONTROL PYRAMID SPOOLING SYSTEM, the wire-line crosses over at two points on directly opposite sides of the drum and causes the line to become "Counterbalanced". Previously there was only one cross-over point on the drum at which the line would build up diameter, causing the drum to have a slightly "Out of Balance" condition which could set up "Vibration" at high speeds or when going into the hole. LeBus has practically eliminated all virbration with their new system and through this system they still control and hold the pyramid action of the line as it builds up on the drum. Evidence of "Perfect SPOOLING" is pictured (above).

*PATENTED and OTHER PATENTS PENDING

LeBus International Engineers, Ltd.

Executive Offices: 305 Wichita National Bank Building, WICHITA FALLS, TEXAS

Sales, Service Control and Warehouse Stock: LONGVIEW, TEXAS

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REDUCE BUBBLE-TRAY WEIGHT UP TO 75 PER CENT with Republic Enduro Stainless Steel. This bubble tray, correctly engineered, can be lifted by only two men when made out of Enduro Stainless Steel. If otherwise constructed, it might take eight men to handle it. Add to this big weight saving, high strength and corrosion resistance. Then Enduro Stainless Steel refinery equipment becomes one of your biggest bargains.

micro-structure means . . .

in Republic ELECTRUNITE® Carbon Steel Heat Exchanger Tubes

UNIFORM MICRO-STRUCTURE, after controlled normalizing in Republic's modern furnaces, insures complete recrystallization of the weld area, relief of all cold working stresses in the metal, and insures uniform hardness and ductility plus fine grain structure throughout the tube.

UNIFORM STRENGTH means the tube has a weld as strong as any part of the wall, as shown by laboratory tests as well as severe service.

UNIFORM WALL THICKNESS means no longitudinal thin spots. Thermal stresses are reduced to a minimum. Weight is uniform. Tubes then expand evenly with less danger of over- or under-rolling.

UNIFORM DIAMETER means uniform size, uniform roundness. Then tubes slide easily and quickly through holes in headers and drums.

UNIFORMITY means pressure tubing that lasts longer and is less costly to install. And Republic ELECTRUNITE Pressure Tubing offers uniformity unmatched by any other.

ELECTRUNITE Carbon Steel Heat Exchanger Tubing has been used for more than twenty-five years by leading refineries. It does an outstanding job. It is produced to ASTM A-214 and many customers' specifications.

Before you place your next order for pressure tubing, get all the facts about Republic ELECTRUNITE Pressure Tubes. Just fill out and mail in the coupon.

REPUBLIC STEEL

World's Widest Range of Standard Steels and Steel Products

TOP-QUALITY GREASES AND OILS NEED THE PROTECTION of Republic Steel Barrels, Drums and Pails. They are strong, sturdy, durable—made to resist rough handling and to cut maintenance cost. Available in a wide variety of sizes and cover types. Made of hot-dip galvanized steel, hot-dip tinned steel, mill-galvanized sheet steel, hot-rolled open-hearth steel, and corrosion-resisting Enduro Stainless Steel.

CONSTANT UNIFORM CIRCUMFERENCE OF REPUBLIC LINE PIPE means high-speed welding. Joints line up quickly and accurately. And uniform wall thickness means a strong, sound weld every time. Republic makes three kinds of quality line pipe: Expanded Electric Fusion Weld (24" to 30" O.D.); Electric Resistance Weld (2⅜" to 16" O.D.); and Continuous Butt Weld (⅛" to 4" nominal).

the finest Oil Country Pipe you can carry!

YARDLEY *PressuRated* KRALASTIC PIPE

YARDLEY "K" PIPE was developed for your needs . . . backed by a company that knows oil country pipe requirements. *PressuRated* means you get the same working pressure for every size.

Yardley "K" precision molded fittings for solvent welding means fast lay-up at minimum labor cost for your salt water disposal systems, lead lines, gathering lines, risers and vent tubes. Yardley "K" is made in 100 lb. and 150 lb. types making pipe selection easy for every installation. Each length prominently and permanently carries the pressure rating and manufacturer's name.

Excellent for natural gas, and many chemical, pipe installations. Safe, non-toxic for drinking water supply lines. The smooth interior finish assures free flow.

Yardley Bulletin 151 gives complete installation instructions, pressure drop charts, working pressures versus temperatures, product specifications and chemical resistance tables.

Note these additional "pay oil" features: Yardley "K" Pipe is a natural insulator—no wrapping or electrolytic protection needed. Engineered wall thickness assures maximum impact strength and resistance against burst and collapse. Normally supplied in 20-foot lengths, coupling attached. Sizes from ½-inch to 6-inch. Only Yardley "K" Rigid Pipe is *PressuRated*.

Don't hesitate—find out now what Yardley *PressuRated* "K" Pipe can mean to your oil field operation. Send for prices and Bulletin 151 giving complete information.

All Yardley "K" Pipe is manufactured from virgin Kralastic as supplied by the Naugautuck Chemical Co., properly pigmented to prevent ultra-violet oxidation, and warranted to meet all specifications when used in accordance with manufacturer's recommendations and terms of sale.

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In Canada: Daymond Co., Ltd., Chatham, Ont.

latest in gas carburetor design

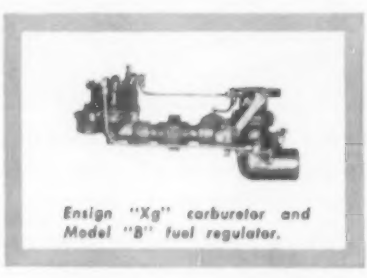
by

ENSIGN

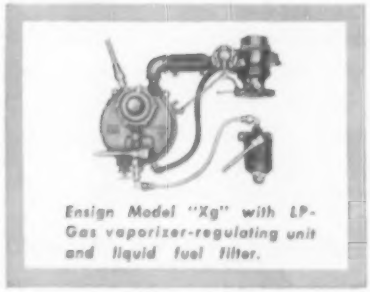
MODEL

Xg

Ensign Model "Xg" in updraft position using 90° air horn.



Ensign "Xg" carburetor and Model "B" fuel regulator.



Ensign Model "Xg" with LP-Gas vaporizer-regulating unit and liquid fuel filter.

The carburetor you see pictured above is the Ensign Model "Xg," latest development in modern gas carburetion.

An engine designer or an oilfield service man will find the "Xg" complete in every detail. Easy to install in either updraft or downdraft positions. Every adjustment is easy to make (all adjustments are shown in view above.) Built-in economizer is a mighty important feature during part throttle engine operation. The famous Ensign easy starting device, the biggest boon to gas engine dependability in many years, plus a wide selection of venturi sizes make the "Xg" the last word in gas carburetion design.

Use the Model "Xg" with Ensign Model "B" gas pressure regulator or with Ensign LP-Gas vaporizer-regulating units and you'll enjoy the finest gas engine performance possible in this day and age.

And as progress in the gas engine business unfolds itself you'll find Ensign there first with the most modern equipment—equipment already proved and field tested. Our engineers are years ahead of day to day demands; anticipating future needs, experimenting, improving and testing. For over 42 years we have specialized in carburetion to the exclusion of all else.

Send for Ensign Model "Xg" Bulletin #7078

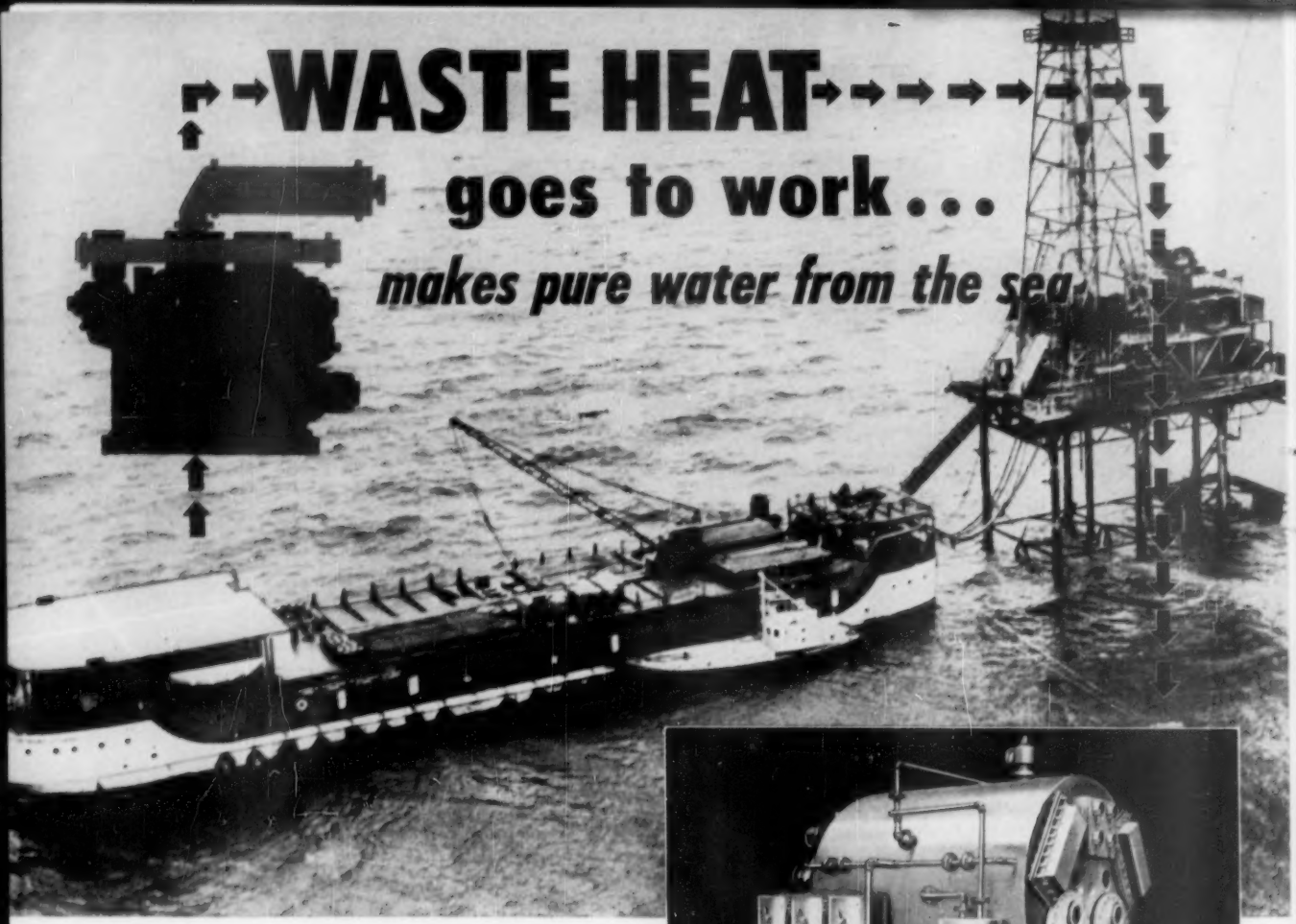
ENSIGN CARBURETOR COMPANY

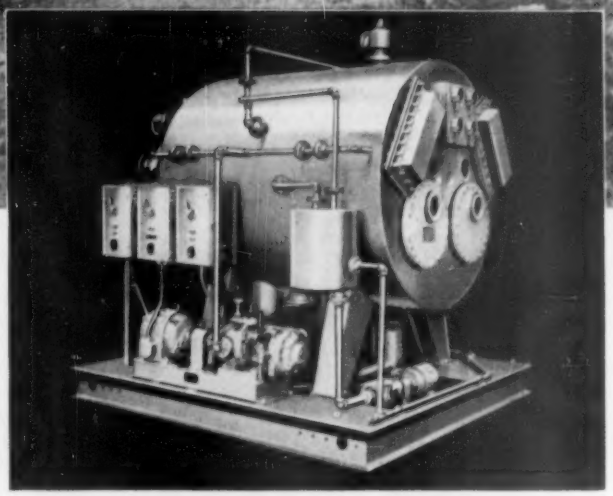
7010 S. ALAMEDA ST., BOX 229, HUNTINGTON PARK, CALIF.
Branch Factory, 2330 W. 58th St., Chicago 36, Illinois

Dealers and Distributors in all Principal Oil Fields.

WASTE HEAT goes to work...

makes pure water from the sea





CATC and Cleaver-Brooks join to make history with potable water at zero cost

Diesel engine cooling water need no longer be wasted. It can go to work as a *valuable tool, producing low-cost pure water!* This was demonstrated recently with the launching and christening of the CATC's off-shore drilling tender, *Jack Cleverley* at the Levingston Shipbuilding Company, Orange, Texas.

This installation represents *the most modern Waste Heat Evaporator in this area of operations.* It is the ultimate in design for this type of service.

Cleaver-Brooks Company is proud to have been part of this event. We salute the CATC Group, including Continental Oil Company, Atlantic Refining Company, Tide Water Associated Oil Company, Cities Service Company and the Levingston Shipbuilding Company.

Cleaver Brooks

BUILDERS OF EQUIPMENT FOR THE GENERATION OF HEAT AND POWER

Cleaver-Brooks Waste Heat Evaporators are particularly adaptable to off-shore drilling platforms, tenders and diesel barges

Practically no scale removal. Potable water is produced from the sea at zero cost because unit uses waste heat from rig's diesel engines . . . transmitting it through heat exchangers charged with sea water. Hot water flashed into a vacuum chamber is partially converted into steam, which is then condensed on cooling coils for the output of distilled water for "mud" make-up, drinking, etc. Unit above has a capacity of 300 gph — similar units can be built to match actual water needs.

For complete details on Waste, Heat, Flash Type, Vapor Compression and Low-Pressure Steam Evaporators — for any pure water need — write: CLEAVER-BROOKS COMPANY, Dept. H, Special Products Division, 377 E. Keefe Ave., Milwaukee 12, Wis., U.S.A. Cable Address: CLEBRO-Milwaukee — all codes.

"NO-OX-ID BEATS A BRINY PROBLEM"

There is no environment in nature more corrosive to iron and steel than sea water. That's why proper protection of undersea pipeline installations is so vitally important. The line must be sufficiently shielded to withstand a continuous bath of brine... not for weeks or months, but for many years.

Dearborn's "B-7" specification materials give underwater carrier lines complete protection—the kind of protection they need for long-term, uninterrupted service.

This 10" pipe was mill coated with NO-OX-ID 6X, No. 7 NO-OX-IDized Reinforced Asbestos Wrapper, NO-OX-ID Service Coat No. 15 and kraft paper. The joints were then protected with NO-OX-ID 6X and NO-OX-IDized Wrapper, followed by an application of Rock Shield, banded over the entire surface.

Brine-resisting "B-7" is only one of many NO-OX-ID coating and wrapper combinations. Others provide protection against abrasion, soil stress and moisture absorption...and insulate against electrolytic action. Whatever your pipeline protection problem—there is a NO-OX-ID Coating Combination to do the job...under ground or under water.

Whether applied by hand...by Traveliner...or at the mill, NO-OX-ID Combinations are your best assurance of lasting pipeline protection. On your next job, take advantage of Dearborn's experience —ask for recommendations.

Dearborn NO-OX-ID®

For Long-Term Pipeline Protection

DEARBORN CHEMICAL COMPANY
Merchandise Mart Plaza, Dept. OG, Chicago 54, Ill.

☐ Please send me complete information about NO-OX-ID
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The new Star Recorder charts are permanent, accurate, easy to read and to understand! Let an Eastman engineer demonstrate the sensational new features of the Star Recorder to you.

Leased and serviced exclusively by Eastman's 26 offices. Call the Eastman office nearest you.

The Star Recorder Corporation manufactures its own product at Denver, Colorado, and has no connection with any other similar instruments or devices.

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P. O. Box 1500 • Denver, Colorado, U.S.A.

Rockwood FogFOAM SpotPROTECTION System automatically drenches loading platform.

How to muzzle a vicious fire hazard

Dangerous, small-area fire hazards can viciously destroy life and nearby property — if not properly protected.

The tank truck loading platform above, for instance, imperils not only the tank trucks being loaded but also the storage tanks in back of it. Should a truck connection break during loading causing a static spark thus igniting a truck, millions of gallons of gasoline would go up in flames.

A Rockwood SpotPROTECTION FogFOAM System keeps this hazard muzzled — goes into action within 5 seconds of a fire's start. It cools entire area, blankets platform, controls fire, and protects surrounding area within minutes.

Each Rockwood SpotPROTECTION System is custom engineered to meet individual requirements of hazard. Systems handle WaterFOG, FogFOAM, FOAM or "WET". Three sizes: 2, 4 or 6 Heads. Operated automatically or manually. Automatic operations are for fixed temperature sprinkler type fire detectors or for heat actuated devices. Special Systems also available for use with Rockwood FOAM Maker Chambers.

Find out how these SpotPROTECTION Systems can meet your needs. Mail coupon below.

ROCKWOOD SPRINKLER COMPANY

Engineers Water . . . to Cut Fire Losses

Rockwood Foam, available in 5-gallon cans or 50-gallon drums, keeps Rockwood FOAM and Rockwood FogFOAM SpotPROTECTION Systems constantly replenished. No replacement problem.

Rockwood "Wet", available in 5 gallon cans or 50 gallon drums, increases penetration and extinguishing power of water. Excellent where fire is deep-seated or water scarce.

SEND FOR THIS INFORMATIVE BOOKLET

ROCKWOOD SPRINKLER COMPANY
Portable Fire Protection Division
1062 Harlow Street
Worcester 5, Mass.

Please send me your engineering data sheet on Rockwood SpotPROTECTION Systems.

Name _____

Title _____

Company _____

Street _____

City _____

Zone _____ *State* _____

Like feeding a bronco

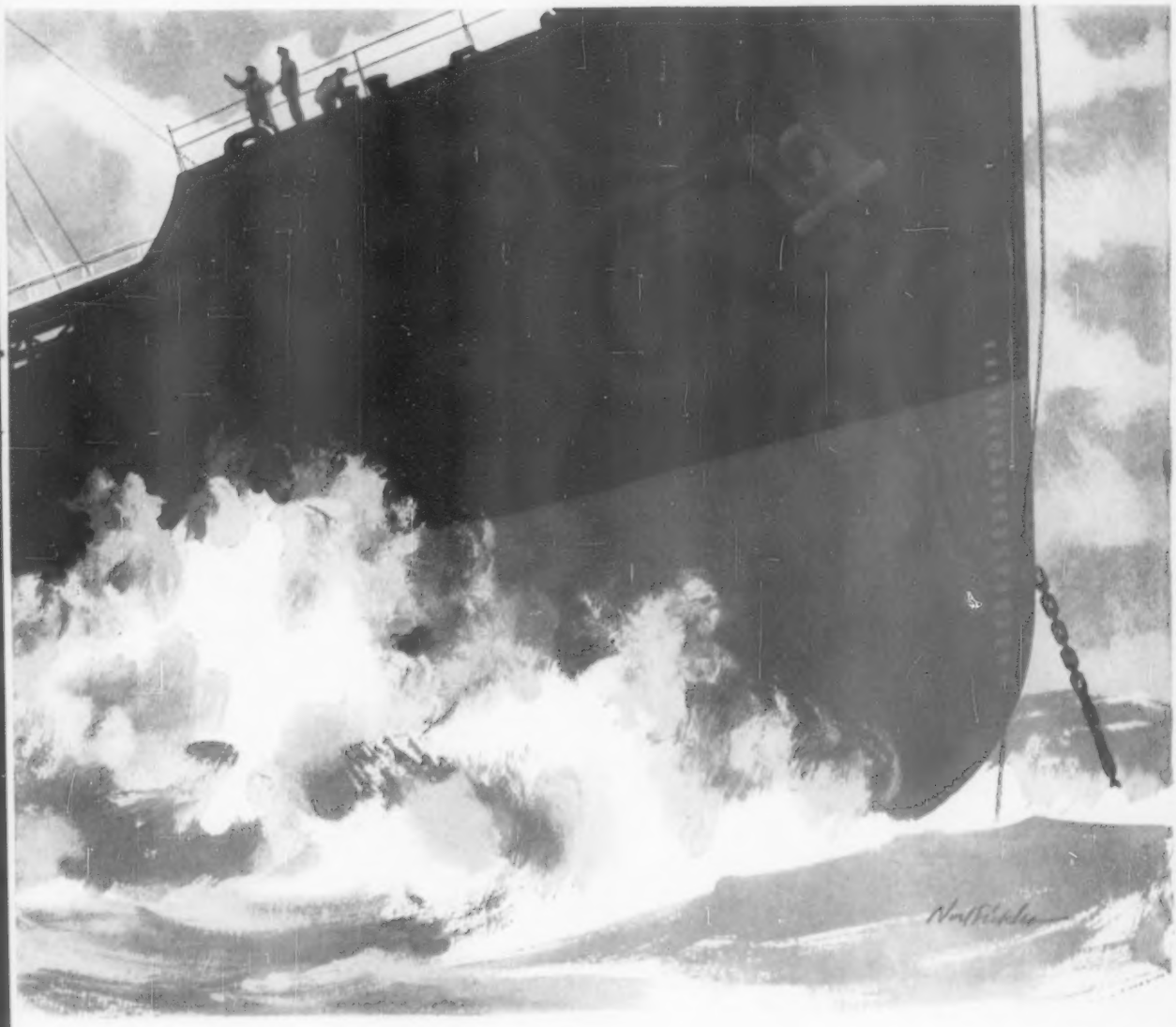
It's a simple matter to drive into your service station and say, "fill 'er up." But behind this everyday request is the big story of how the petroleum industry constantly battles jungle, desert and ocean waves to satisfy the world's thirst for oil. For example: take the case of this tanker loading at a California terminal.

It must be loaded half a mile out to sea because there is no harbor or breakwater. As a result the ship has no protection from wind and wave during loading operations. In fact, when heavy seas are running, four mooring buoys and the ship's anchor are used to keep her away from the dock. This makes it necessary to suspend the loading hoses across a 75 to 100 foot expanse of raging water.

Obviously, under such rigorous conditions loading hoses were taking a terrific beating

Hewitt-Robins
INCORPORATED HR STAMFORD, CONN.

EXECUTIVE OFFICES
STAMFORD, CONNECTICUT



that's busted loose!

during dirty weather, and were failing prematurely under such torturous treatment. That is, until lengths of Hewitt-Robins Smooth Bore Oil Suction & Discharge Hose were installed. For this, super-tough Hewitt-Robins hose has loaded more barrels per length than the best record of any other kind used.

Building better loading hose to feed wave-tossed tankers is but one of the ways in which Hewitt-Robins is helping American industry.

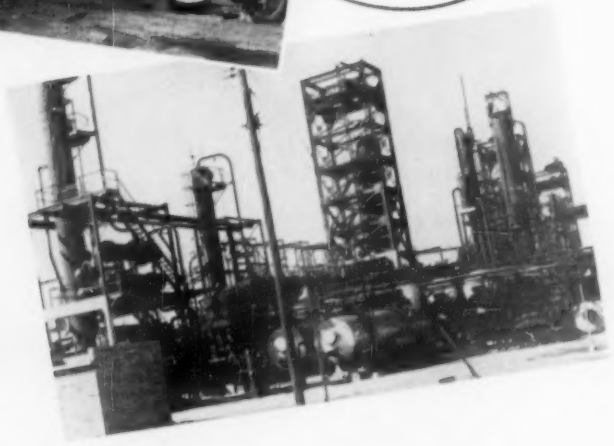
Whether it's hose to handle liquids or gases —belt conveyor systems (both belting *and* machinery) to convey solids in bulk—or vibrating equipment to screen, feed or shake out material, Hewitt-Robins equipment can solve your particular problem, large or small. Contact our nearest sales office, your local Hewitt-Robins distributor, or write to our executive offices.

Industrial Hose—Conveyor Belting—Conveyor Machinery—Vibrating Screens—Vibrating Conveyors —Design, Manufacture, Engineering and Erection of Complete Bulk Materials Handling Systems.

Now's The Time
Here's The Place

NATIONAL BANK OF TULSA

NBT



To Finance Your Oil Field Operations

As a pioneer in oil industry financing, "The Oil Bank of America" is equipped with the experience and resources to finance your sound oil field operations.

Whatever your particular phase of the industry may be, National Bank of Tulsa's officers can serve you intelligently, quickly, adequately, anywhere in the Mid-Continent, Mountain or Mid-West Areas. Discuss your plans and requirements with National Bank of Tulsa's officers who *know* the oil business.

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The Oil Bank of America

OFFERING COMPLETE BANKING AND TRUST SERVICES

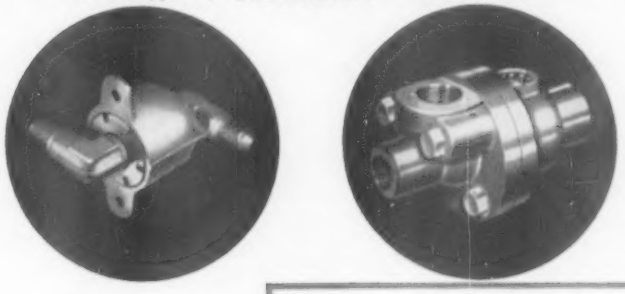
Above unretouched photograph shows the "guts" of the original 2" style 50 single ball race CHIKSAN Swivel Joint after 20 years of rigorous service in the California oil fields. Note the good condition of the wearing surfaces. This joint has been improved through the years to the present modern double ball race joint.

The CHIKSAN Ball Bearing Swivel Joint illustrated above is an unretouched photograph of a veteran of 20 years service on an oil well cementing hose.

ASSURE MINIMUM MAINTENANCE, HIGHEST QUALITY WITH CHIKSAN

Pioneer manufacturer of ball bearing swivel joints . . .

Modern types of **CHIKSAN** *swivel joints.*



- Over a quarter of a century of "know-how" in design, manufacture, and successful application of swivel joints.
- Originator and largest exclusive manufacturer of ball-bearing swivel joints.
- The widest range of styles, sizes and pressures available for every major industry.
- Packing designs available for each specific service, assure constant torque at any given pressure.
- World-wide recognition for highest quality and lowest maintenance costs.
- Complete nation-wide coverage by qualified field service engineers.
- If you require unlimited flexibility with unlimited life—be sure you *specify* and *buy* CHIKSAN Ball Bearing Swivel Joints.

CHIKSAN

Supply and Service of CHIKSAN Ball Bearing Swivel Joints is always as near as your telephone. Write CHIKSAN for Specific Catalog Information. Dept. 37

THE NEW TOOL OF MODERN INDUSTRY

the flow of enterprise relies on **CHIKSAN**

BALL-BEARING SWIVEL JOINTS

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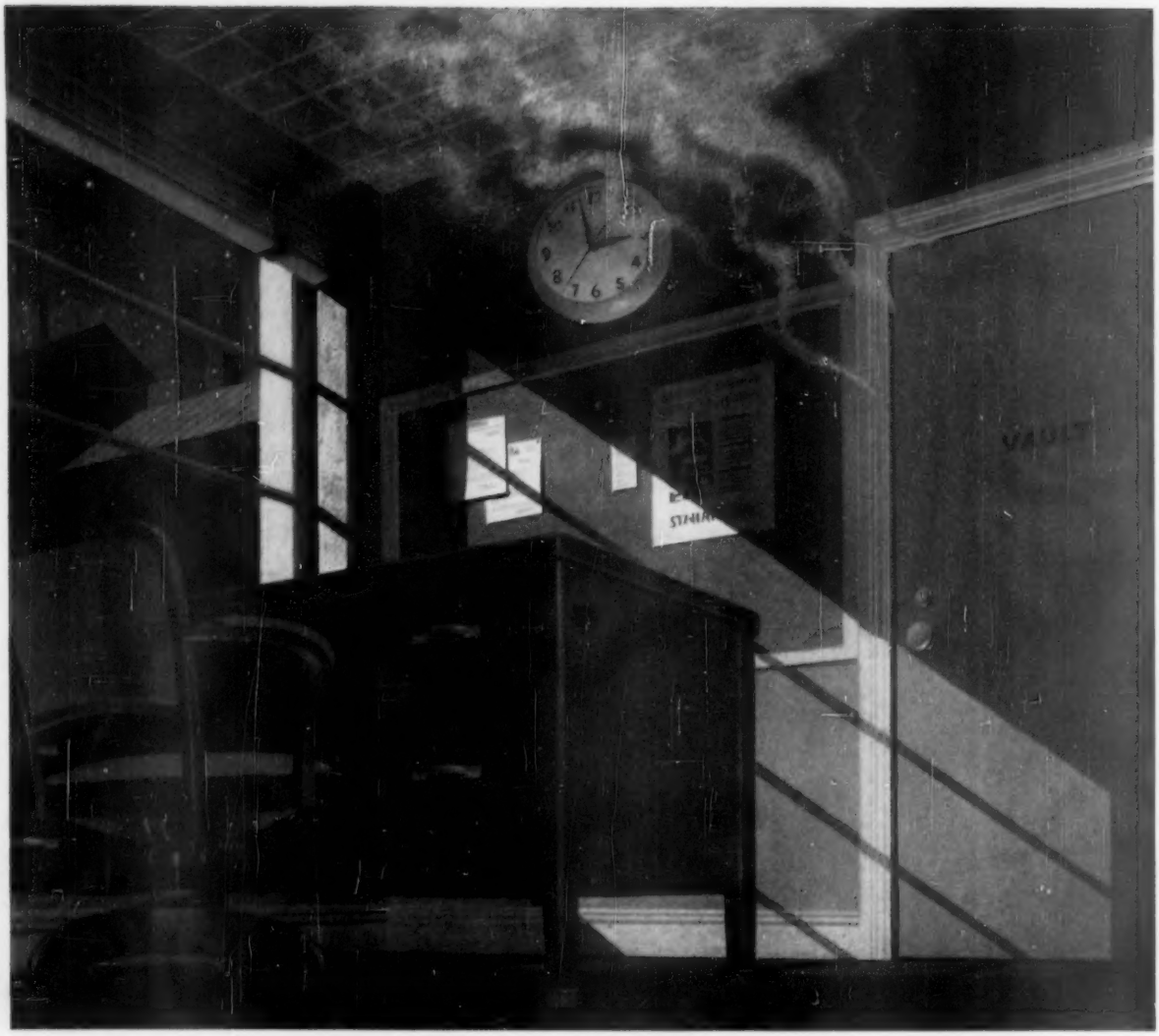
Well Equipment Mfg. Corp. (Division), Houston 1, Texas • Subsidiaries: Chiksan Export Co., Brea, Calif., Newark 2, N.J. • Chiksan of Canada Ltd., Edmonton, Alta.



WHAT HAPPENS NEXT?

If management has been wise, a fire tragedy will be stopped before it starts...if not, in 20 minutes extensive destruction and total loss could readily be the result.

First-rate fire protection is essential to the continued success of any business. With C-O-TWO Smoke or Heat Fire Detecting Systems, plus C-O-TWO High Pressure or Low Pressure Carbon Dioxide Type Fire Extinguishing Systems, as well as PYRENE Air Foam Type Fire Extinguishing Systems for specific outdoor locations, your plant can have fast, positive round-the-clock fire watchman service simultaneously at each fire hazard point . . . a fire tragedy is stopped before it starts.

Furthermore, there is a personal sense of responsibility inherent with PYRENE—C-O-TWO Fire Protection Engineers that assures you of fully adequate firesafety . . . a definite plus in your behalf. Whether it's fire detecting or fire extinguishing . . . portables or built-in systems . . . PYRENE—C-O-TWO means top quality backed by experienced engineering that results in operating superiority for you at all times.

Act now . . . don't take unnecessary chances with your investment any longer . . . the extensive experience of PYRENE—C-O-TWO over the years is at your disposal without obligation. Remember . . . a plant-wide fire protection survey skillfully executed today could be the means for greater profits tomorrow.

Pyrene

PYRENE — C-O-TWO

NEWARK 1 • NEW JERSEY

Sales and Service in the Principal Cities of United States and Canada

C-O-TWO

COMPLETE FIRE PROTECTION

portable fire extinguishers . . . built-in fire detecting and fire extinguishing systems

CARBON DIOXIDE • DRY CHEMICAL • VAPORIZING LIQUID • SODA-ACID • WATER • CHEMICAL FOAM • AIR FOAM

More and more leading oil companies and independent oil exploration consultants are using the "Royal Scintillator" to investigate the radioactive "halos" surrounding oil fields. The number of favorable field reports on this technique are increasing daily.

We agree that not enough data is available as yet, however, there is a growing body of opinion which holds that this is a valuable oil exploration aid. Following are excerpts from letters* we have received indicating what some of the leading firms in the country say about our instruments.

"I have used this scintillator extensively prospecting for oil and am amazed at how easily oil trends are defined."—F.V., Salina, Kansas.

"We have made surveys in approximately 30 areas in Kansas, Oklahoma, and Texas. Of 13 drilled, 5 were accurately predicted. The other 8 were in error due to insufficient basic data."—A. B., Ft. Worth, Texas.

"We use Precision Radiation Instruments exclusively having found them the most accurate and constant. Using what we feel is the finest instrument available along with approved geophysical and geological techniques we are able to meet the exacting requirements of our broadening exploratory efforts."—R.E.P., Dallas, Texas.

We cannot guarantee that the Model 118 "Royal Scintillator" will locate oil, but we can guarantee that the "Royal" is the best instrument made for investigating the radiation pattern existing around oil fields. It is also the best instrument made for Uranium prospecting, and its use for this purpose should not be overlooked by oil geologists.

For full information contact your nearest dealer or write direct for our free pamphlet on "The Principles of Oil Field Detection with Scintillation Counters" and our complete catalog on Geiger Counters and Scintillators.

*Originals of these letters are on file at our office.

PRECISION RADIATION INSTRUMENTS, INC.

Please send me your FREE oil survey pamphlet and catalog.

Name_____ Title_____

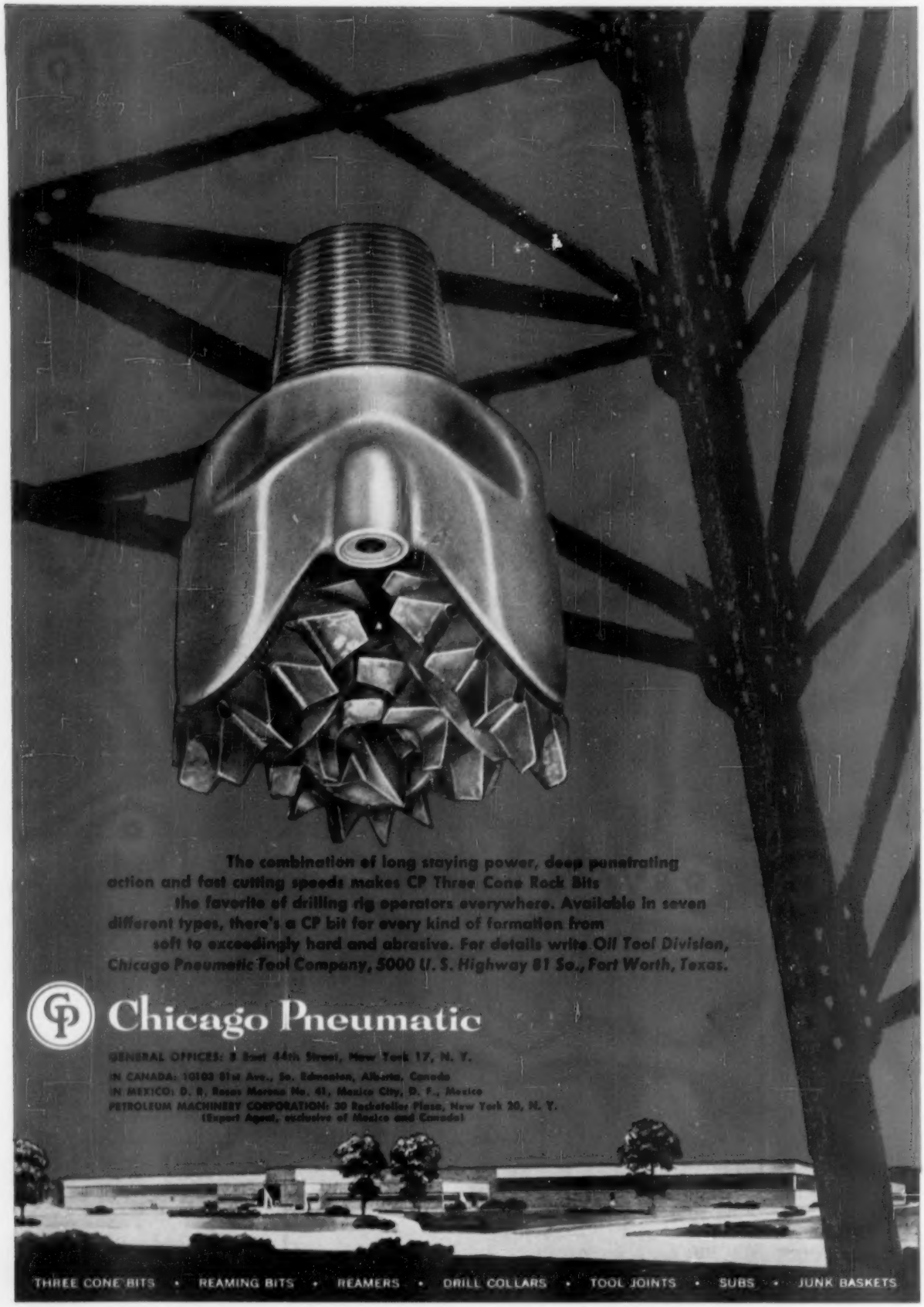
Company_____

Address_____ City_____ State_____

PRECISION RADIATION INSTRUMENTS, INC.

4223OG W. JEFFERSON BLVD., LOS ANGELES 16, CALIFORNIA

World's Largest Manufacturer of Radiation Instruments


The combination of long staying power, deep penetrating action and fast cutting speeds makes CP Three Cone Rock Bits the favorite of drilling rig operators everywhere. Available in seven different types, there's a CP bit for every kind of formation from soft to exceedingly hard and abrasive. For details write Oil Tool Division, Chicago Pneumatic Tool Company, 5000 U. S. Highway 81 So., Fort Worth, Texas.
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GENERAL OFFICES: 8 East 44th Street, New York 17, N. Y.
IN CANADA: 10103 81st Ave., So. Edmonton, Alberta, Canada
IN MEXICO: D. R. Reses Moreno No. 41, Mexico City, D. F., Mexico
PETROLEUM MACHINERY CORPORATION: 30 Rockefeller Plaza, New York 20, N. Y.
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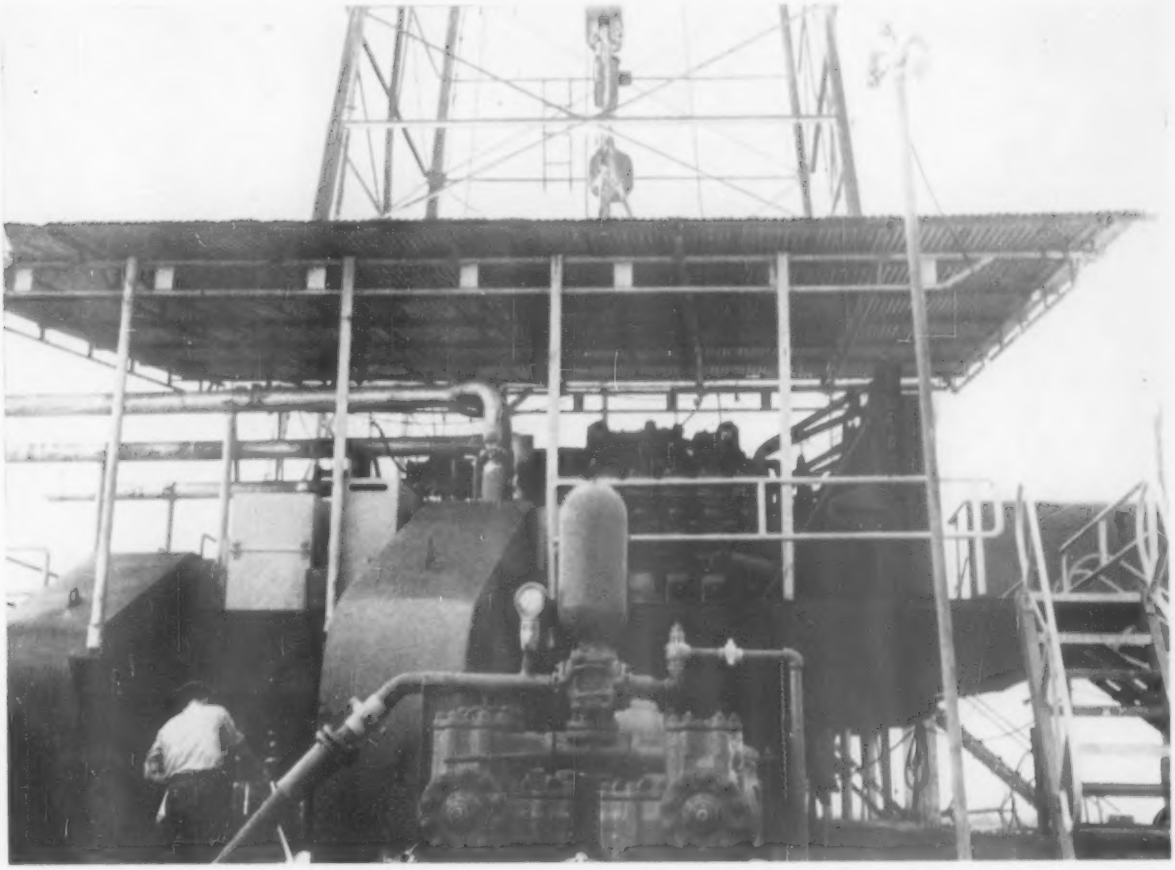


Deephole Drilling . . . In a Hurry !

. . . the acceleration, lugging power, and dependability you get from Le Roi L3460 and L4000 engines mean faster round trips and lower drilling costs.

WHEN you have to go deep you need plenty of horsepower. And the place to get it is from Le Roi's L3460 with 600 max. hp. or its big brother, the L4000 with 655 max. hp.

You get much more, too. You get compactness. These V-12 overhead-valve engines are only 164 in. long. That makes them ideal for drill-rig installation, because they pack a lot of power in a small space — give you more horsepower per dollar.

But that's not all you get from these high-output engines. They represent the first, truly new design concept in 15 years. They have improved fuel economy; integral crankcase and cylinder construction for greater rigidity; longer bearing life; hydraulic valve lifters; better manifolding; husky crankshaft with integrally forged counterweights for unbelievably smooth operation — modern features that mean lightning response to load demands, outstanding performance and dependability.

Like all Le Roi engines, they're built to stand oilfield handling; they're easy to service; they have a wide speed range up to 1350 rpm; and they operate on natural gas, butane, or gasoline.

Ask your supply house or Le Roi distributor to show you an L3460 or L4000 at work. See for yourself why they can help you make hole faster. Literature is also available — just write us for it.

P-139

LE ROI *Division of Westinghouse Air Brake Co.*

Milwaukee 14, Wisconsin

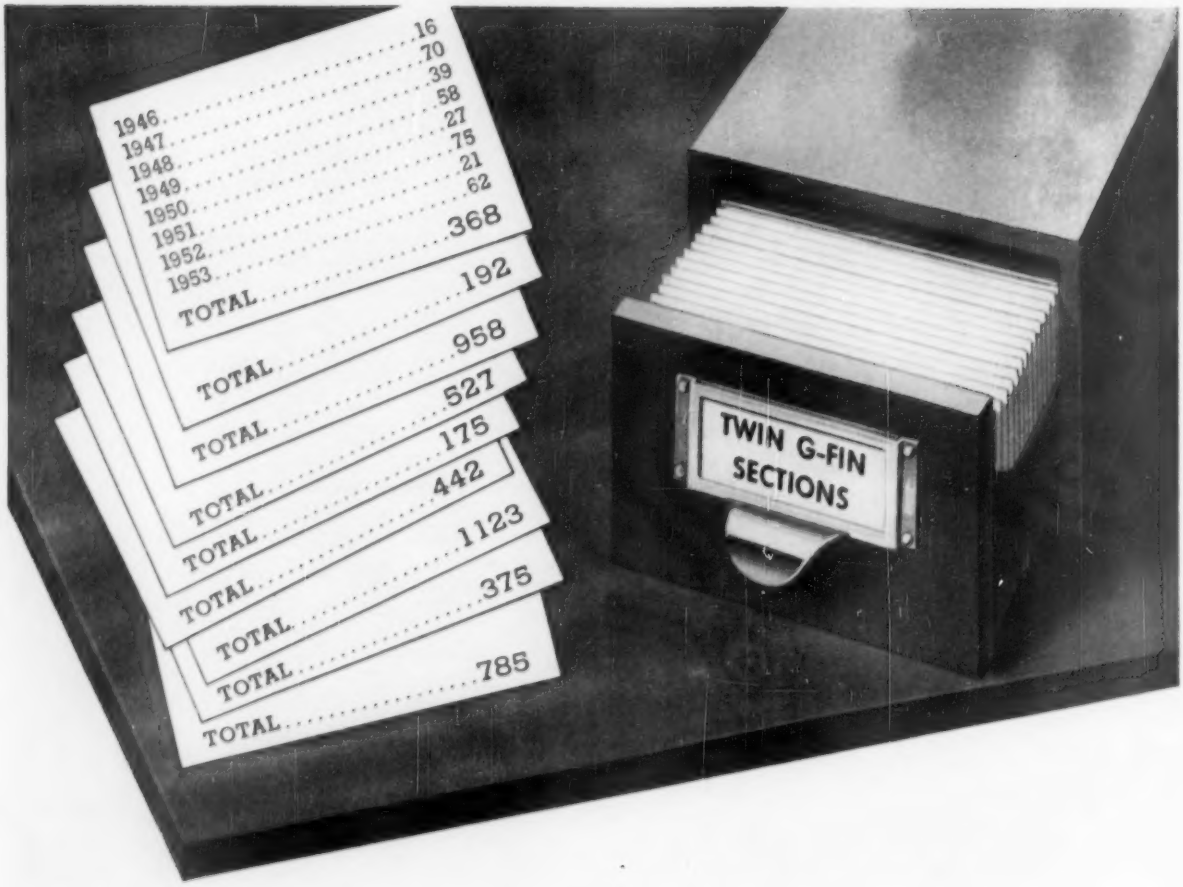
PORTABLE AIR COMPRESSORS

TRACTAIR

STATIONARY AIR COMPRESSORS

AIR TOOLS

ENGINES

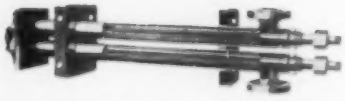


They're all repeat orders for G-R Twin G-Fin Sections

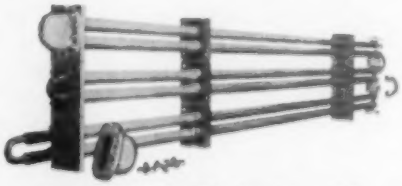
Re-orders — the ultimate proof of satisfactory service — run into the hundreds for many, many purchasers of G-R Twin G-Fin Sections.

Users have re-ordered and **continue to re-order** these units because of the uniformly top-notch performance of each successive installation. In many instances, they have re-ordered and **continue to re-order** to extend the application of these many-purpose heat exchangers to services throughout their plants. Customers all over the country have re-ordered year after year for ten, fifteen years and more, running up the astonishing total of more than 70,000 installed Twin G-Fin Sections during the course of the 25 years since Griscom-Russell originated this design of heat transfer apparatus.

Write for Bulletin 1400 describing the G-R Twin G-Fin Section in detail.



Sectional view of the G-R Twin G-Fin Section



Stack of G-R Twin G-Fin Sections partially dismantled to show ready accessibility of the longitudinally finned heat transfer elements

THE GRISCOM-RUSSELL CO.
MASSILLON, OHIO
A SUBSIDIARY OF GENERAL PRECISION EQUIPMENT CORPORATION

G-R
HEAT TRANSFER APPARATUS

GR-347

Twin G-Fin Section

...and Refineries, too

Yes, refineries, too, have found the Austin-Western Hydraulic Crane has Versatility Where It Really Counts.

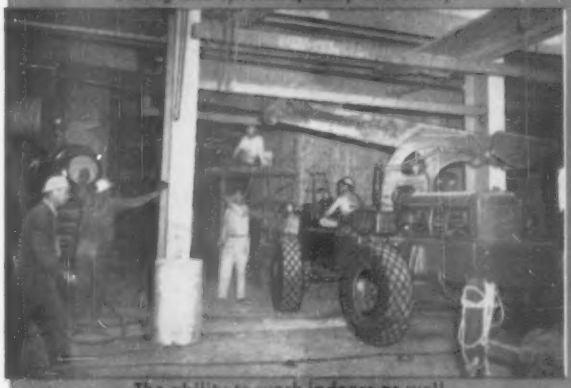
Full hydraulic boom action—including swing, raising and lowering, crowd and hoist—even while under load—adds up to the only true "live" boom, and when mounted on its sturdy, short-coupled All-Wheel Steer chassis, you have the most maneuverable piece of construction and maintenance equipment of its kind, indoors as well as outdoors.

Without a doubt, it's the tremendous work capacity of the A-W Hydraulic Crane—the standout performance—that is proving every day on hundreds of jobs—that the A-W Hydraulic Crane is your answer to today's low cost requirements.

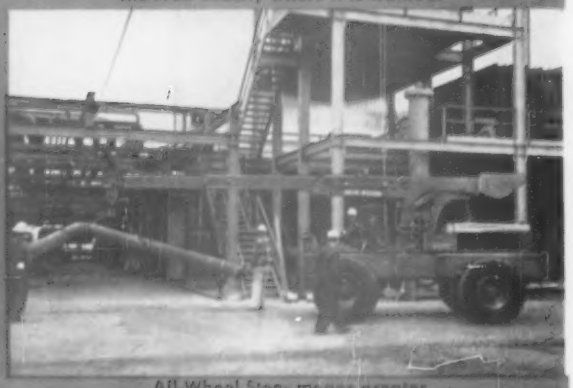
And, of course, it's the modern way to do it.

As much as 5 tons can be lifted, carried, swung and spotted quickly and easily.

Finger-tip hydraulic control places the load exactly where it is wanted.



The ability to work indoors as well as outdoors doubles its work capacity.



All-Wheel Steer means greater maneuverability than ever before.

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Construction Equipment Division • Baldwin-Lima-Hamilton Corporation

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Power Graders • Motor Sweepers

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622 Farnsworth Avenue, Aurora, Illinois

Please send complete information and literature on the Austin-Western Hydraulic Crane.

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Title _____

Company _____

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. . . THE COMPLETE QUALITY LINE . . . POWELL VALVES . . . THE COMPLETE QUALITY LINE . . .

POWELL LUBRICATED PLUG VALVES

FIG. 3059G—300-Pound Steel Flanged End Valve. Sizes 6" to 12".

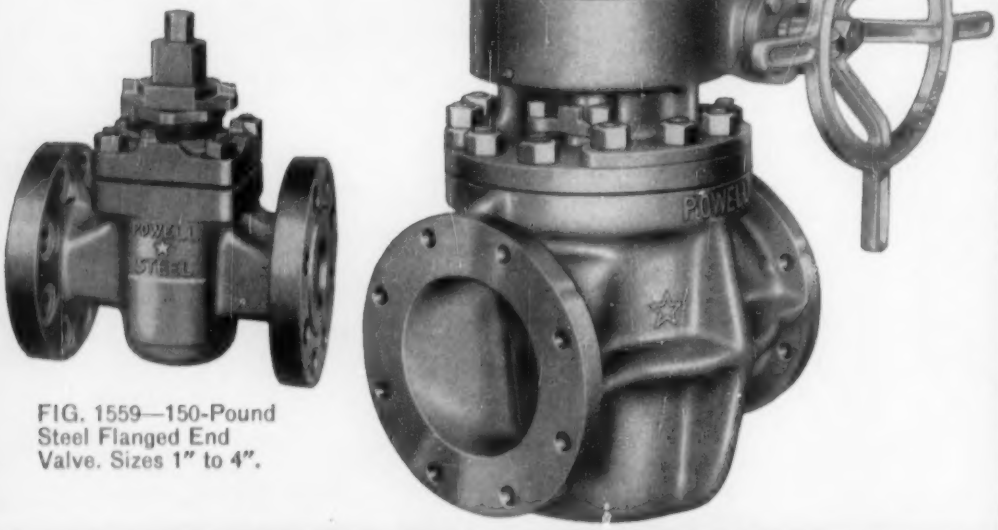

FIG. 1559—150-Pound Steel Flanged End Valve. Sizes 1" to 4".

. . . THE COMPLETE QUALITY LINE . . . POWELL VALVES . . . THE COMPLETE QUALITY LINE . . .

POWELL VALVES . . . THE COMPLETE QUALITY LINE . . . POWELL VALVES

Powell Valves—the *complete* quality line—offer many outstanding features in these new Lubricated Plug Valves, such as quick and sure operation and a positive seal when the valve is closed.

Valves are available with screwed or flanged ends; single, screwed and bolted gland types, and in Semi-Steel, Carbon Steel, Bronze, Ni-Resist, Monel Metal, and Stainless Steel. Semi-Steel valves are rated 175 and 200 pounds W.O.G.; Steel valves, 150 and 300 pounds W.P. Sizes from 1" to 12". Valves in sizes 6" and larger can be furnished with gears for gear operation. Distributors located in principal cities. For descriptive literature—or help on valve problems—write direct to

The Wm. Powell Company, Cincinnati 22, Ohio . . . . . 109TH year

GM DIESEL
CASE HISTORY No. K-255

OWNER: Kerr-McGee Oil Industries, Inc., Oklahoma City, Okla.

INSTALLATION: 13 General Motors 2-cycle Diesel engines. Four 6-110 "Twins" drive Ideco draw works and Triplex mud pumps. One 6-71 "Twin" powers independent catworks, rotary drive and coring reel. Two GM 6-71 Diesels drive two Halliburton Cementing Pumps, one 4-71 GM Diesel powers Halliburton Mixer.

PERFORMANCE: Rig capable of drilling to 18,000 feet. Has completed first well off Gulf Coast. Barge measures 140 feet long, 102 feet wide. Use of GM Diesel power saves space and weight, gives quick-acting, dependable power for lower-cost drilling.

Clears more deck for action

ON ANY rig, the trim, space-saving design of General Motors 2-cycle Diesel engines really pays off. Offshore, they can be mounted on a smaller barge—yet give you more work-space on deck. On land, they're easy to load on trucks—can be moved without special road permits.

And GM Diesels give you the power you need in a smaller, lighter engine. Their *2-cycle* operation delivers power on every piston downstroke for faster acceleration and a smoother power flow that helps you make hole faster, at less cost.

What's more, you always find GM Diesel factory-authorized service available when and where you need it. GM Diesel distributors—with a complete stock of *factory* parts—blanket the oil fields.

Get acquainted with the GM Diesel distributor nearest you. He'll be glad to recommend the best GM Diesel model for your drilling needs.

DETROIT DIESEL ENGINE DIVISION
GENERAL MOTORS • DETROIT 28, MICHIGAN
Single Engines... 30 to 300 H. P. Multiple Units... Up to 893 H. P.

VISIT GENERAL MOTORS POWERAMA Gala Celebration of 100 Million GM Diesel Horsepower—Lake Shore South, Chicago—Aug. 31st through Sept. 25th

GENERAL MOTORS CORP., DIESEL ENGINE SALES, PETROLEUM INDUSTRY, 1504 PHILTOWER BLDG., TULSA, OKLAHOMA

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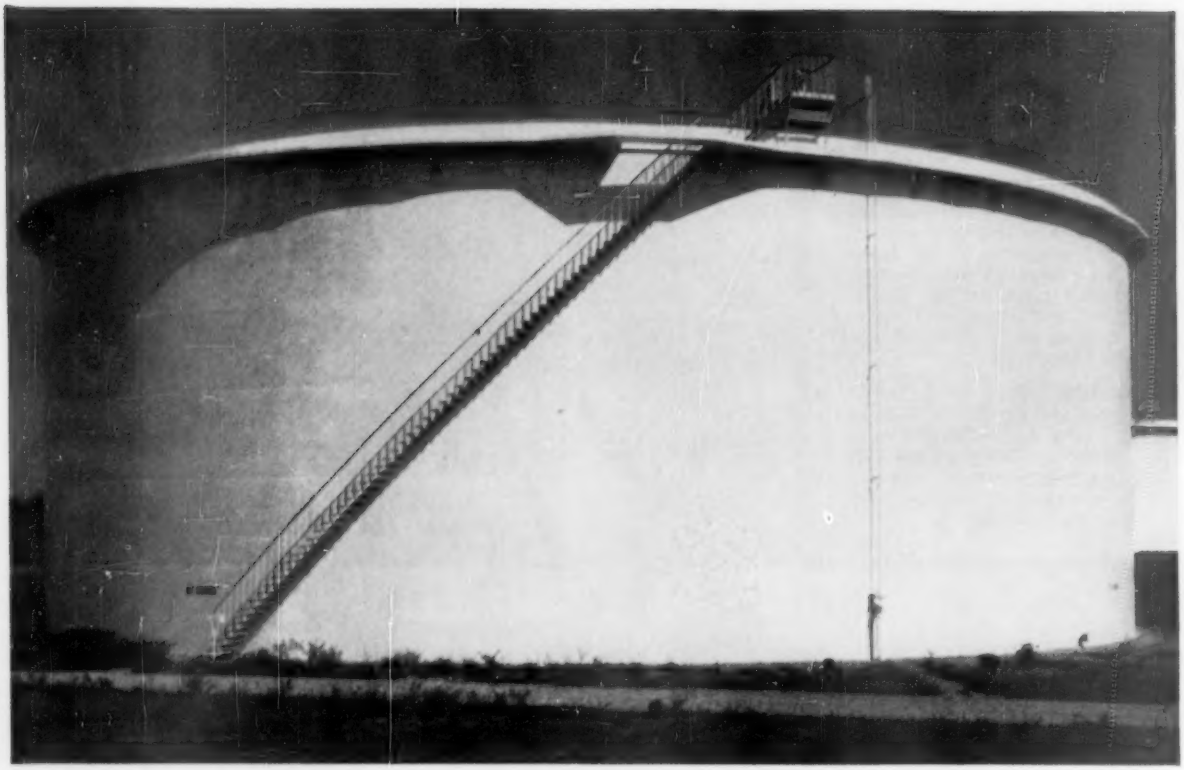
IN CANADA—Distributors in all key locations, under
GENERAL MOTORS DIESEL, LTD.
London, Ontario



the GRAVER "Double-Deck"—our costliest... and often least expensive... floating roof design

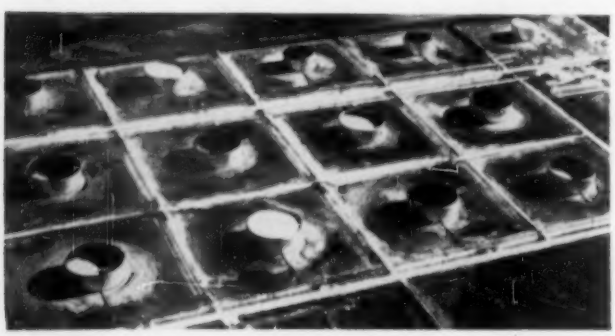
While the Graver Double-Deck Floating Roof Tank is the costliest of our three "floaters," it often proves least expensive in the long run.

Its unusual strength and structural stability make it appropriate wherever lots of snow and ice are encountered. The double-deck roof, consisting of top and bottom deck plate, is divided into liquid-tight compartments. Thus it is practically unsinkable. With the Graver Double-Deck Floating Roof Tank maintenance costs are held to a minimum.

Other popular Graver designs include the Center-Weighted Floating Roof Tank which is unusually stable. We offer also a pan-type floating roof...an economical design suitable to southern climates where snow and ice present no hazard.

Whatever your storage needs it will pay you to contact Graver. Consultation costs you nothing, and competent Conservation Engineers are ready to serve you.

GRAVER ... *a conservative design to fit every need*



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GRAVER TANK & MFG. CO., INC.

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Here's a HANDFUL of Reasons why *You* should use WECO UNIONS

SELECTED RAW MATERIALS — only the finest forgings and castings made to our exacting specifications are used to manufacture WECO Unions. That's why they are stronger, longer-lasting . . . cut down costs on job after job.

ADVANCED MANUFACTURING PRACTICES assure matchless quality, unvarying uniformity, complete dependability of every WECO Union.

BALL AND CONE SEAT, precision-machined, guarantees a positive, leak-proof seal that holds against high pressures, corrosive or abrasive fluids, shock and vibration.

RUGGED ACME THREADS on female sub and wing nut allow quick, effortless make-up and break-out repeatedly without damage or distortion.

HEAVIER WALL SECTIONS on sub ends are turned and knurled for uniform thickness, extra strength, easy wrenching. They're built to take a beating and ask for more, month after month.

These are a handful of reasons why you should use WECO Unions. There are many others. Ask your supply store or our representative for the complete story of long-lasting, trouble-free WECO Unions. They are available in sizes and pressure ratings for every requirement.

U6-55

it's wise to standardize with.. WECO

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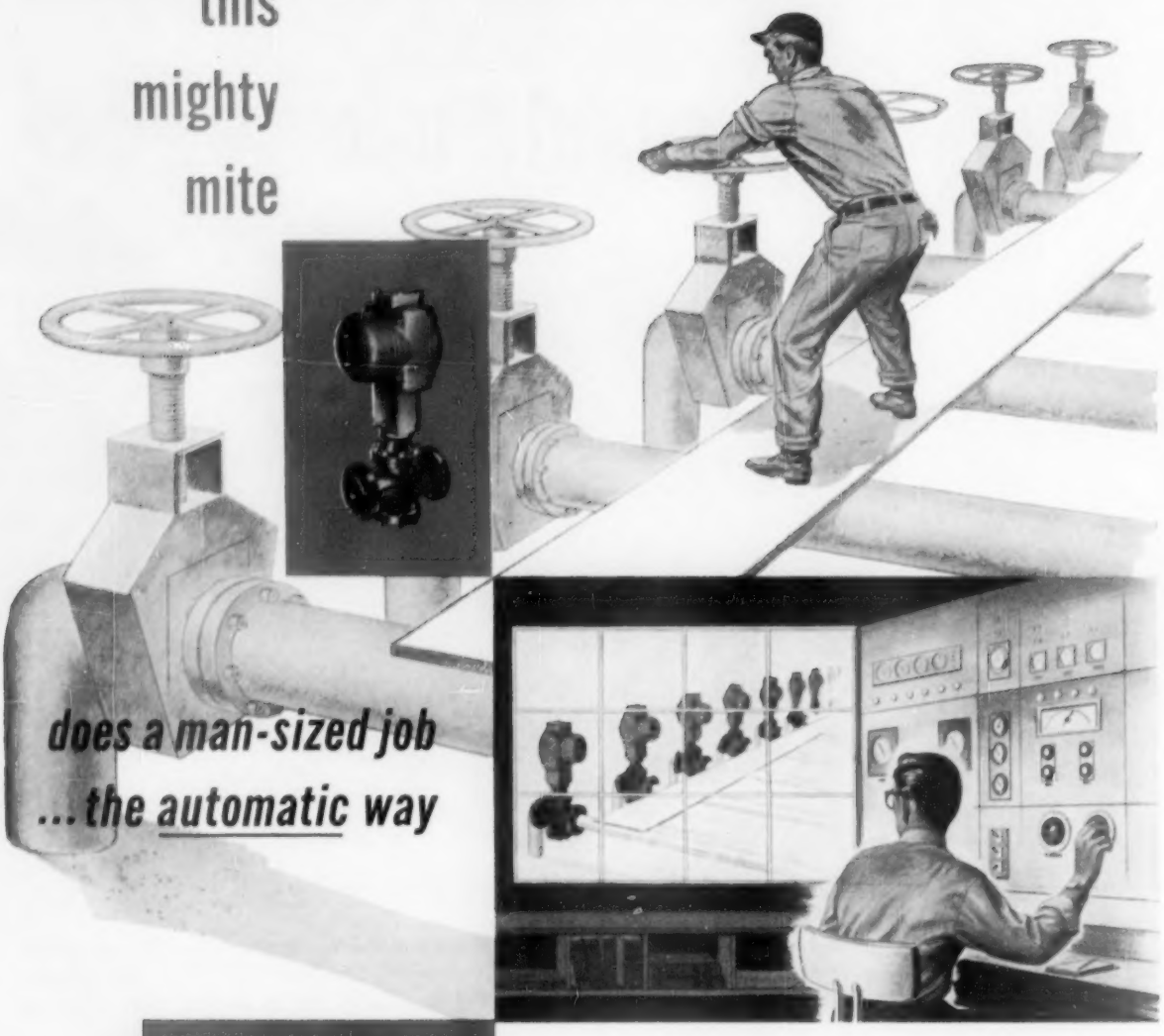
WELL EQUIPMENT MFG. CORP. • Division of Chiksan Company • HOUSTON 1, TEXAS

this mighty mite



does a man-sized job ...the automatic way

General Controls Hydramotor Valves

Yesterday, an army of men fought against time and strained against valve wheels in plants and fields all over the country—wherever high pressure fluids or gases flowed through large pipelines. Now the army seems to have vanished. But it *hasn't*. Today, a new regime is in order... we call it Automation. And the unseen, tireless army is made up of Hydramotor valves. Day and night, in literally thousands of applications—whatever the weather, opening or closing speed required, or power available—these General Controls electro-hydraulic motor valves are on the job.
Progress made perfect—the *automatic* way!

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J&L SpringKore is the first wire rope that gives rotary drillers outstanding flexibility, resistance to crushing and economy all in one rope.

A new principle in Wire Rope construction, SpringKore has just what the name implies, a center consisting of a tightly coiled high quality steel spring. The outer strands are laid up around this uniform, highly flexible, crush resistant center—in standard J&L rotary drilling line constructions. Where the severe crushing action of rotary drilling distorts ordinary drilling lines, SpringKore's diameter stays uniform longer. Clearance between strands is maintained, resulting in greater flexibility and increased fatigue life. Finally, the hollow center of the coiled spring acts as a reservoir for lubricants to reduce internal wear and corrosion.

In the field SpringKore has already proved it has resiliency and toughness unequaled in wire ropes of equivalent strength and cost. The result: operating *economy* that's measured in terms of more hole per wire rope dollar.

J&L STEEL **Jones & Laughlin**
STEEL CORPORATION — *Pittsburgh*

Here's what you get with SpringKore:

- **Long term flexibility**
- **Resistance to crushing action**
- **Complete lubrication**
- **More supporting contact points**
- **Uniform diameter**
- **Better spooling**
- **Less inside wear**

Fill in the Coupon and Let's Get Together!

Jones & Laughlin Steel Corporation
416 Gateway Center, Pittsburgh 30, Pa.

☐ Send me a free copy of your booklet "J&L SpringKore Wire Rope."

☐ Please have your nearest representative call.

Name_____ Title_____

Company_____

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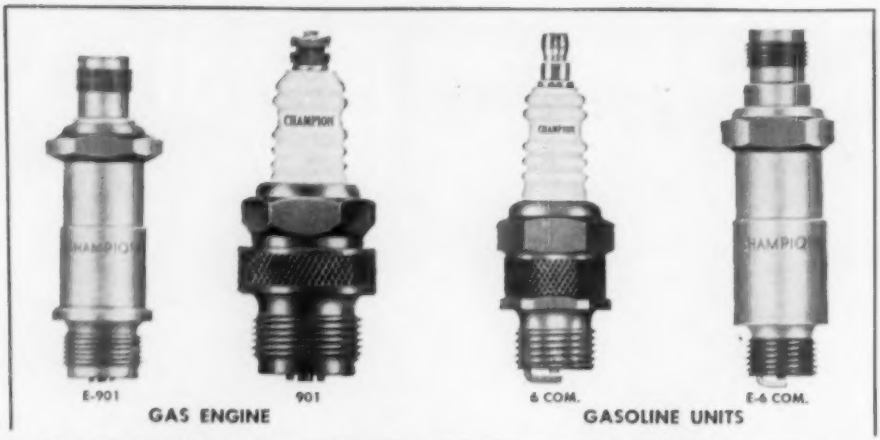
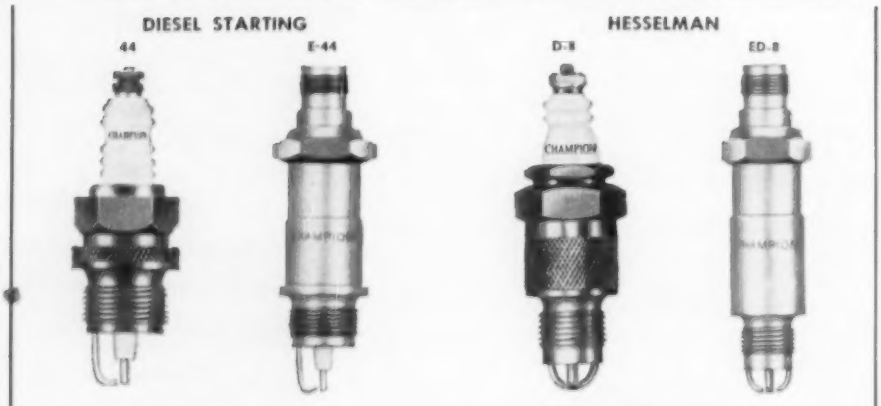
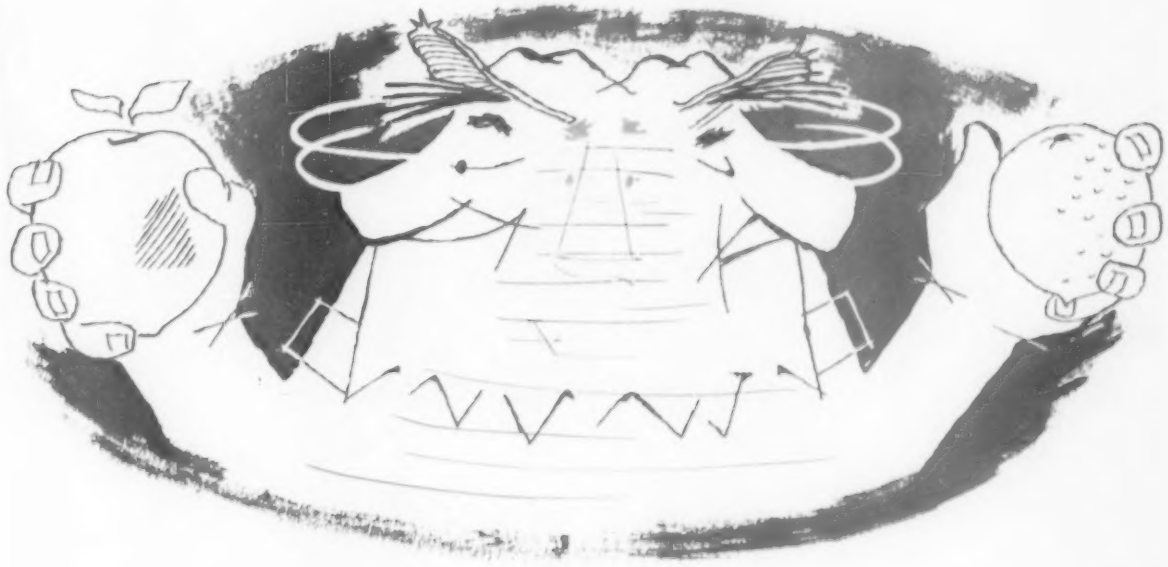


For better performance in every industrial and oil field engine specify dependable CHAMPION SPARK PLUGS!



CHAMPION SPARK PLUG COMPANY, TOLEDO 1, OHIO

YOU CAN'T REPLACE A PEACH WITH A LEMON!



says HY WHEELER, the sage of the socket wrench!

Of course, I don't claim *nobody* else makes good bearings—but you're *never in doubt* when you replace a Hyatt with another Hyatt!

Sure, you may save a little dough on "bargain" offbeat bearings—but take it from an oldtimer, *it don't pay in the long run!* Chances are you'll end up havin' to do the whole job over again before long, and with somebody sore at you, too! I figger it's a lot smarter to play safe and *hold out for Hyatts in the blue and yellow box.* When it comes to *quality,*

DISTRIBUTED BY DEALERS EVERYWHERE

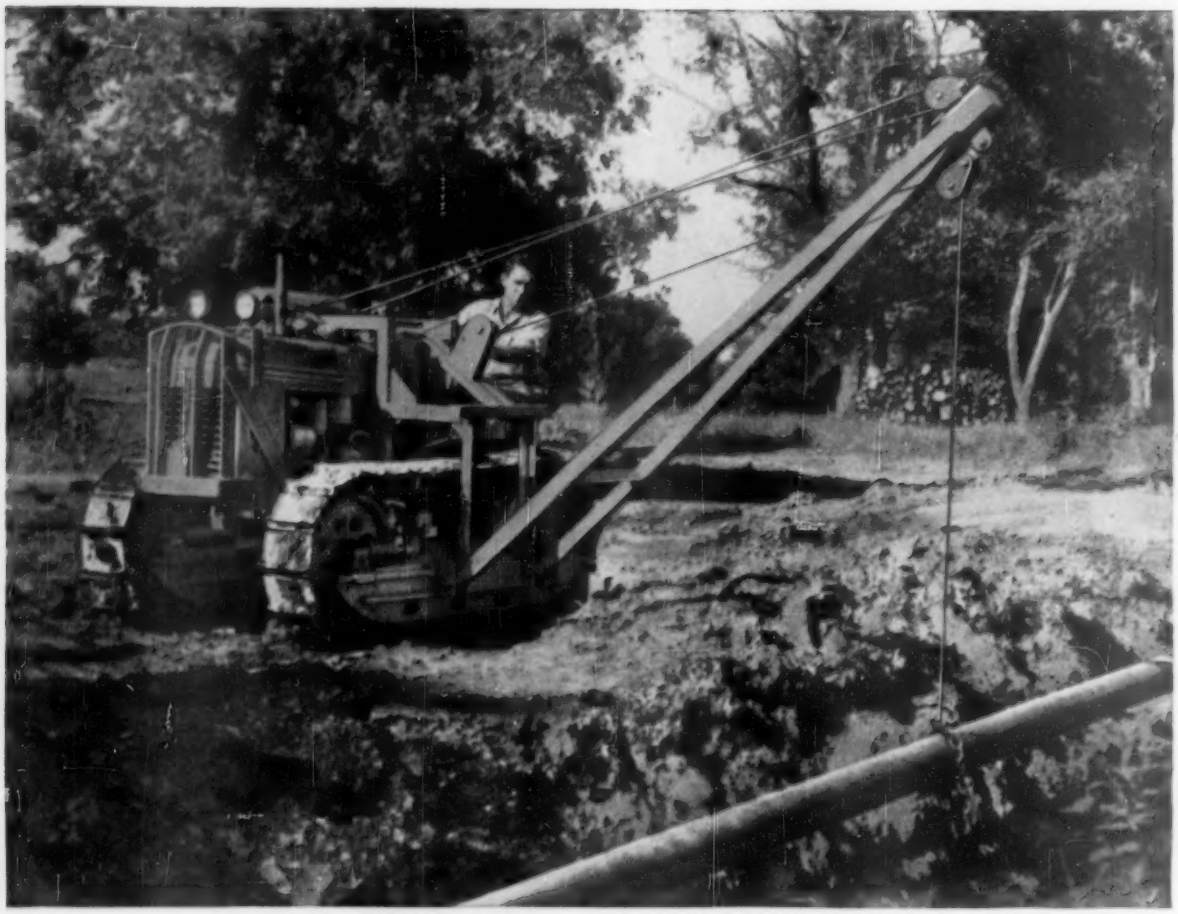
there's no substitute for . . .

HYATT ROLLER BEARINGS

STRAIGHT BARREL TAPER

HYATT BEARINGS DIVISION • GENERAL MOTORS CORPORATION • HARRISON, NEW JERSEY

A GENERAL MOTORS PRODUCT GM A UNITED MOTORS LINE



"Little Boomer": Oliver OC-3 crawler and hydraulic boom do real big job

Nicknamed the Little Boomer, this Oliver OC-3 with hydraulic side boom is proving highly profitable on all types of light pipelaying operations.

The OC-3 is a tough, compact crawler that packs a big 22 drawbar h.p. The size and weight of the Little Boomer (5205 lbs.) handle a surprising amount of heavy-duty work. Lifting capacity is 1600 pounds, and it will lower and lay in up to 6-inch pipe—carry single 48-foot lengths up to 12".

Differential steering on the OC-3 keeps power on both tracks, even on turns. You edge up to the ditch smoothly without jerking. And the OC-3 handles easily as a car—maneuvers quickly in tight quarters. The entire unit transports easily on a light truck or trailer.

Side boom action is hydraulically operated so you can lift and lower with smooth, accurate control. Only two controls operate the boom. Even the inexperienced operator becomes an expert in a short time. Investigate the *low cost* of this unit and its many profit-making advantages. See your Oliver Industrial Distributor.

Here the Little Boomer lays pipe for a new housing development. This unit soon pays for itself on jobs such as this where slow hand labor or larger equipment was formerly required. Note street pads on tracks that prevent damage to road.

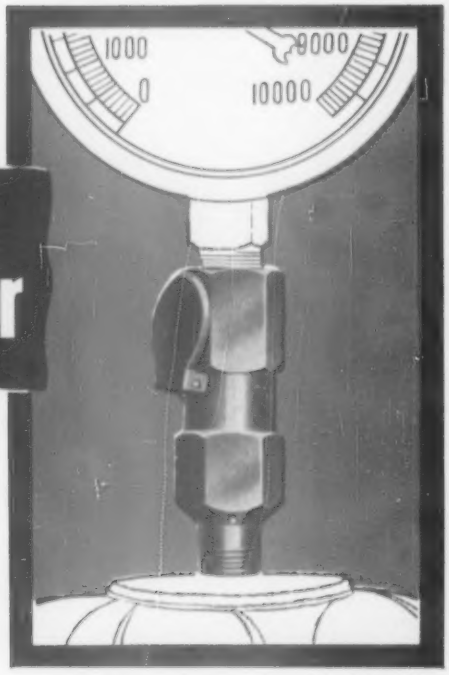
THE OLIVER CORPORATION
400 West Madison Street, Chicago 6, Illinois

A complete line of industrial wheel and crawler tractors

Announcing

THE THORNHILL-CRAVER

Gauge Valve-Connector



Patented — U. S. Patent No. 2618978

- ***Saves Investment In And Maintenance of Christmas Tree Gauges.***
- ***Provides More Accurate Pressure Readings.***
- ***Increases Safety.***

The Gauge Valve and Connector is designed to take the place of permanently installed Christmas tree gauges, providing instead a safe, easy, and inexpensive means of obtaining pressure readings with a single master gauge. Thus, no gauges are left on the tree. All danger of breakage and constant exposure to the elements is eliminated. The investment in gauges is reduced to a single unit, and gauge maintenance is reduced proportionately. Utilizing a single master gauge for all wells on a lease assures uniform, accurate pressure readings.

The Gauge Valve and Connector consists of two stainless steel units: the upper, or connector element, which connects to the master gauge, and the lower, or valve element, which is installed permanently on the Christmas tree.

To obtain a pressure reading, the operator simply inserts the upper element, with master gauge, into the lower element, as illustrated at left. Rotation of the upper element ⅓-turn engages a J-slot and automatically opens the valve in the lower element, exposing the gauge to well pressure. Disengaging the J connection allows well pressure to automatically close the valve. For pressures of less than 500 lbs., a spring-actuated valve is available.

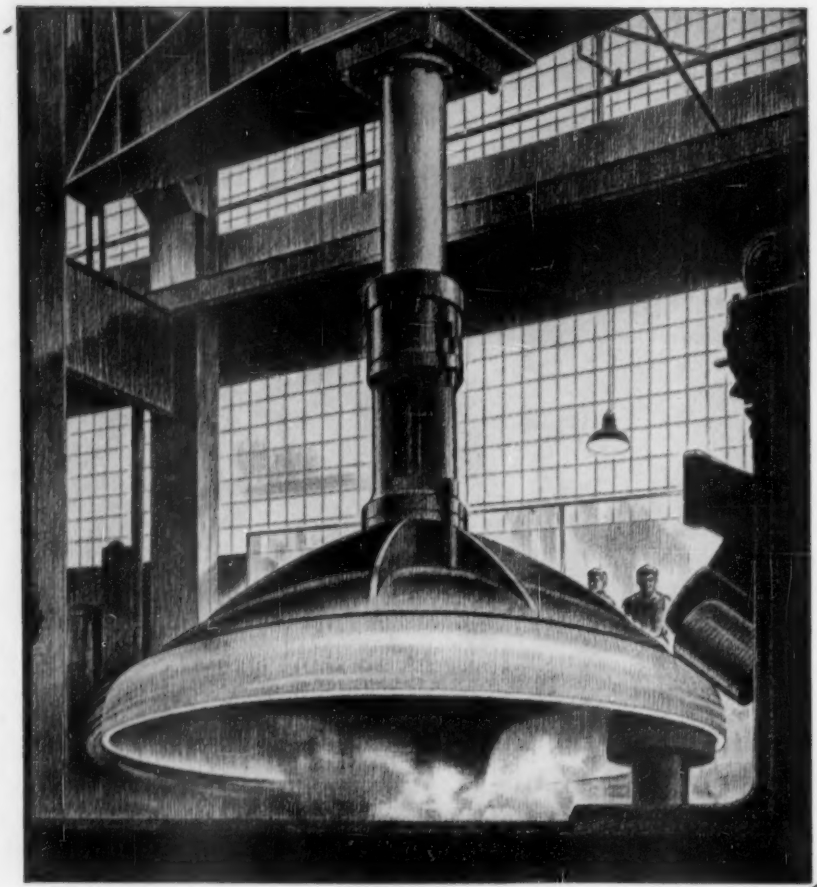
THORNHILL UNIBOLT CRAVER CO.

P. O. BOX 1184
HOUSTON, TEXAS

Spinning

SAVES METAL

—CUTS TOOL COSTS

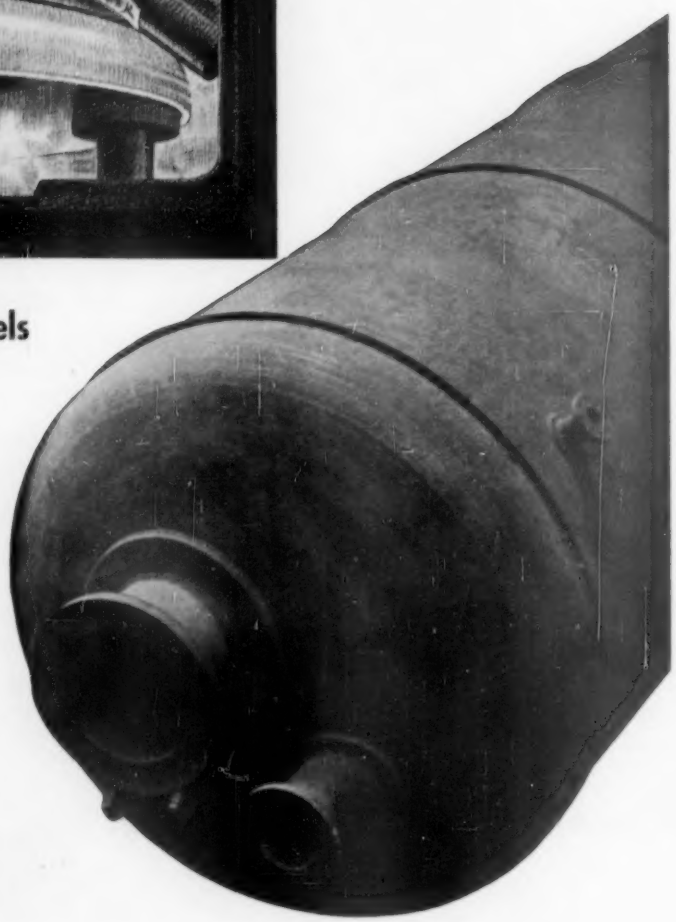


The design and production of Pressure Vessels may be greatly facilitated by using dished and flanged ends spun by Harveys on the Rotarpress. They combine semi-ellipsoidal form with large knuckle radius. A substantial reduction in plate thickness can be effected, and in most cases tool costs are eliminated.

'Rotarprest' Ends for Pressure Vessels

can be supplied in Mild, Alloy and Clad Steels and Non-Ferrous Metals. The capacity of the Rotarpress ranges from 5 to 15 feet diameter, and ⅜" to 4" thickness. Knuckle radii and depth may be varied to meet individual requirements.

Please ask for List No. OG-881 giving full range of sizes.



Harvey

G. A. HARVEY & CO. (LONDON) LTD.
WOOLWICH ROAD, LONDON, S.E.7
ENGLAND
Cables: "Cheaper, London"

at CF&I Seamless Mill

precision threading is checked microscopically

The job requirements for deep wells demand high strength pipe, and the strength of the threaded connection is in proportion to the body of the pipe. Thus, threading is a critical operation in the production of seamless casing and tubing.

At the new CF&I Seamless Mill at Pueblo, Colorado, the pipe is always rolled to an O.D. large enough to insure a good, full thread. The pipe is precisely threaded by automatic machinery of the most modern design. After this operation, CF&I and customer inspectors meticulously gauge the thread lead, taper, height and size. Then the thread is checked with a thread contour microscope, an instrument that determines absolute accuracy of thread angle and form. Finally, thread lubricant is applied to all threads, the couplings are bucked on power-tight and thread protectors are put on both ends of the pipe.

CF&I Seamless Oil Country Casing and Tubing meet API STD 5A specification and are available in sizes from 2⅜" through 9⅝" O.D. CF&I has complete control of the quality of the materials it uses, and production is carefully supervised through every step of manufacture to make sure that CF&I products meet the exacting requirements of the petroleum industry.

SEAMLESS TUBULAR PRODUCTS

THE COLORADO FUEL AND IRON CORPORATION

Denver, Colorado

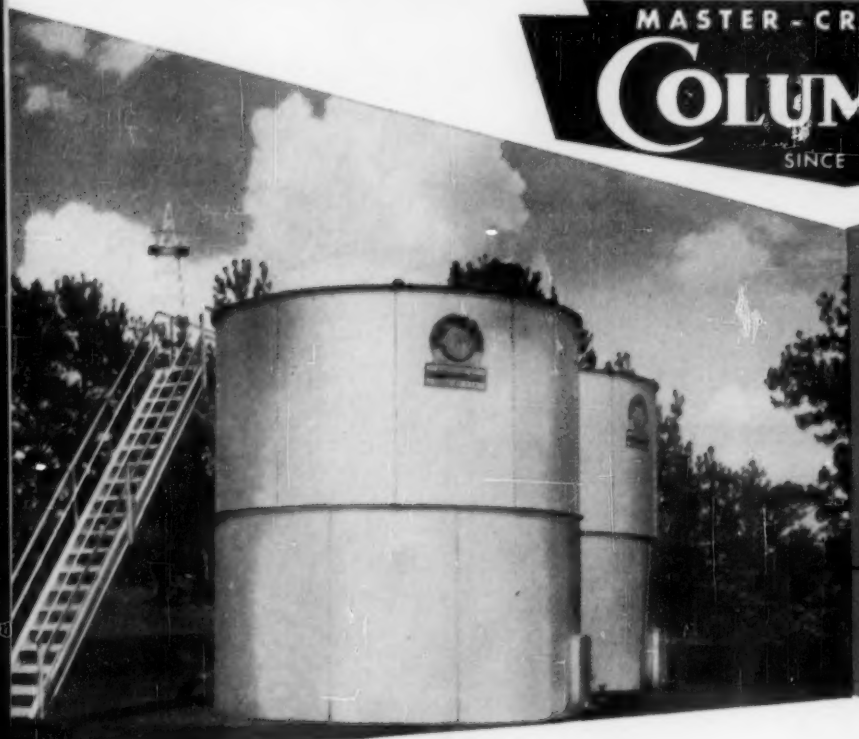
CF&I

3205

MASTER-CRAFTED BY

COLUMBIAN

SINCE 1893



First... for profit

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O'Neill Tank Company, Inc.
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Hays, Kans. — Hill City, Kans.

LOUISIANA
McGuffin Tank Company
P.O. Box 724, Shreveport, La.

McClatchey Tank & Supply Co.
P.O. Box 719, Lafayette, La.

NEW MEXICO
Allied Supply Co.
P.O. Box 798, Artesia, New Mex.

OKLAHOMA
Continental Tank Company
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Mapp Tank Company
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Martin Tank Company
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Kilgore, Texas

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Snyder, Texas

Federal Tank Company, Inc.
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Houston, Texas

Jackson Equipment Co.
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Wichita Falls, Texas

Westex Tank Company
P.O. Box 941, Odessa, Texas

Columbian Steel Tank Company
(Warehouse) 3705 McKinney Ave.
P.O. Box 18057, Houston, Texas

Texas Gulf Tank Company
P.O. Box 14281, Houston, Texas

Box Tank and Supply Company
P.O. Box 547, Beeville, Texas

WYOMING
O'Neill Tank Company
P.O. Box 154
Casper, Wyoming

TANKS FOR THE WORLD

Trade Mark Reg. U.S. Pat. Off.

precision engineered
Columbian Bolted Steel Tanks

From the first hours saved in erection time to the decades of lasting service there's no more profitable oil storage than Columbian Bolted Steel Tanks. The precision engineered, formed and punched plates and decks go up faster, fit tighter, last longer. More than 61 years of experience in fabricating steel is behind the master craftsmanship built into every Columbian Tank, to give it lasting strength. After years of service, a Columbian tank can be quickly taken down and re-erected at a new location, without loss of quality. Whatever tank size you need, wherever you want to locate it, you can depend on Columbian for fast delivery and high quality.

IN THE FIELD OR AT THE PLANT, you can't do better than a rigid, strong, fire-safe Columbian Metal Building — for pumphouse, storage, warehouse, garage or equipment. Easily, quickly erected with accurately fitting sectional panels. Write for Free catalog and complete details.

COLUMBIAN Steel Tank Co. P. O. BOX 4048-J, Kansas City, Mo.

STEEL, Master-Crafted by Columbian... First for Lasting Strength

"Fill'er up for the next 22,000 years!"

Not nearly so ridiculous as it may sound. For the fact is, if this Cities Service tanker were loaded with gasolene, it actually could supply an automobile with enough to last for the next 22,000 years!

It's the S.S. W. Alton Jones, one of the newest members of the Cities Service ocean-going tanker fleet. With a deadweight tonnage of 38,000, a capacity of 336,000 barrels of petroleum, and a speed of 17½ knots fully loaded, it is one of four ultra-modern supertankers now flying the Cities Service flag.

Yet, impressive as they are, these new ships constitute only one example of Cities Service progress during 1954. Cities Service invested over sixty million dollars in the never-ending search for and production of oil during 1954 . . . refinery facilities were modernized and expanded at East Chicago and Lake Charles to make possible even better high-grade petroleum products . . . and hundreds of miles were added to the vast network of Cities Service pipelines.

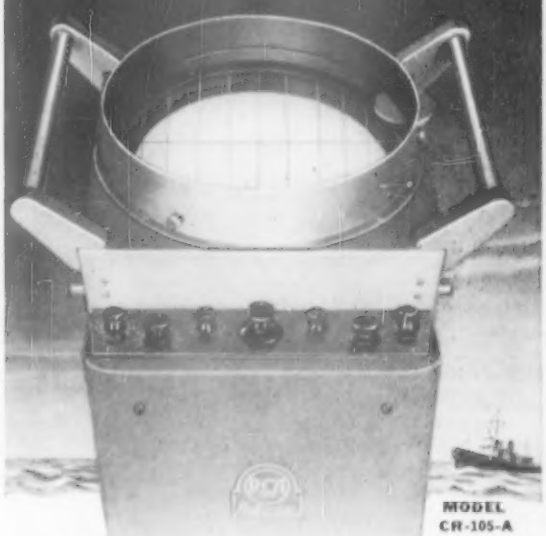
This growth benefits more than Cities Service. It is healthy growth that helps keep our standard of living the highest in history . . . helps fill the vital oil larders of the free world.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

New Radiomarine Small Boat Radar

- Saves Money
- Saves Space
- Saves Power



MODEL CR-105-A

Especially designed for vessels on which space and power are limited, Radiomarine's new CR-105-A Radar offers you the EXTRA features that give you MAXIMUM PERFORMANCE—MAXIMUM CONVENIENCE—MINIMUM MAINTENANCE. Only two basic units—indicator and antenna. Indicator is in deck mounted binnacle . . . keeps picture tube high for best viewing . . . requires less than two square feet of deck space. Antenna is lightweight . . . only 105 pounds. Instant selection of 1-2-4-12-32 mile ranges helps you navigate through foul weather and traffic hazards to cut your trip-time, boost your profits. You'll read the clear, bright pictures on its 10-inch scope easier . . . service it quicker with the easy-access chassis. And here's another saving . . . the Radiomarine CR-105-A requires only 600 watts from ship's battery or other D.C. power supply. Find out more about the new Radiomarine CR-105-A . . . it can mean greater profits for you right now.

RCA

write for free information now!

RADIOMARINE CORPORATION of AMERICA

A SERVICE OF RADIO CORPORATION OF AMERICA

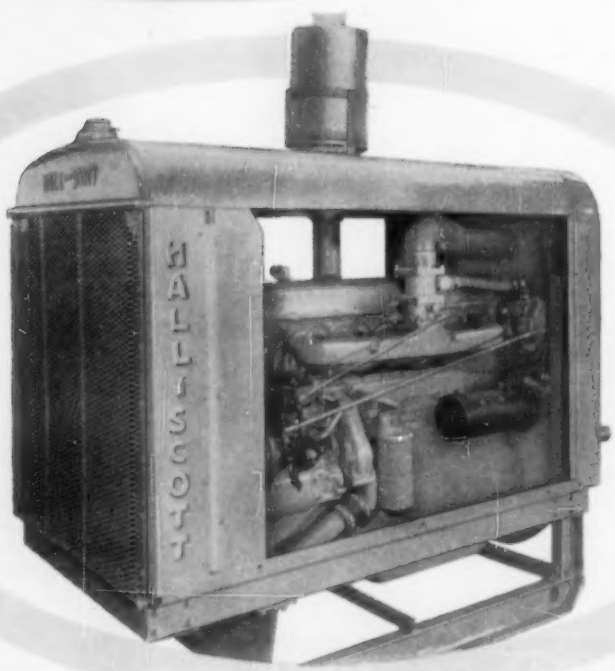
75 VARICK STREET, NEW YORK 13, N.Y.

HALL-SCOTT

A GREAT NEW ENGINE

The new Hall-Scott model 590 brings to the petroleum industry new standards of power and performance, with all the exclusive Hall-Scott features of design and construction. More than 200 HP . . . less than 6 pounds per HP . . . for gasoline or LPG. Get complete information on the full line of Hall-Scott engines for petroleum industry services from your nearest dealer.

Hall-Scott Motors Company
Berkeley 10, California



Alice, Texas
Oilfield Motor Service

Denver, Colorado
Kaer Equipment Co.

Salt Lake City, Utah
Utah Truck & Equip.

Los Angeles, Calif.
Hall-Scott Motors Co.

West Coast Eng. & Equip. Co.
Berkeley, Calif.

Houston, Texas
Motor Maintenance, Inc.

Virginia, Minn.
Northern Hall-Scott Engine Distributors

Portland, Oregon
Roberts Motors Co.

Additional Distributors and Dealers Are Now Being Appointed

EQUIPMENT MEN . . . in the News

National Supply Moves London Headquarters

The London offices of the National Supply Co. have been moved into new and larger premises which were needed to cope with an increased volume of business. The new address is City Wall House, Chiswell Street, London, E.C. 1.

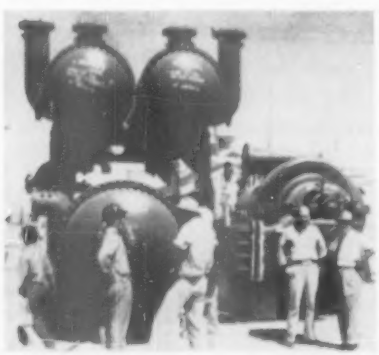
The London branch of National Supply, managed by Richard B. Rogers, takes care of the company's sales in England and to various European and eastern countries. It was established in 1921.

Kirby Is Ideco's Technical Service Representative

Announcement has been made of the appointment of Ed C. Kirby as technical service representative for Ideco, one of the Dresser Industries, Dallas, Tex.

Kirby is well known in the Mid-Continent area. He has been associated with petroleum-equipment manufacturers and suppliers for 30 years. For the past 17 years he has represented Regan Forge & Engineering Co. in 20 states east of the Rockies. With Ideco, Kirby will specialize in supplying Ideco Fabriform sheaves to original manufacturers. His headquarters are in Houston.

Aramco Sets Worthington Centrifugal at Dhahran



Building being constructed around 850-ton Worthington centrifugal refrigeration unit in Dhahran, Saudi Arabia. The new unit, which will be driven by an 1,103-hp. turbine manufactured at Worthington's Wellsville Works, will provide complete cooling facilities for buildings of Arabian American Oil Co.

Helicopter Cuts Offshore Travel Time

Magnolia Petroleum Co.'s three-place Bell helicopter, in service 24 hours a day on Magnolia's offshore drilling platform 8½ miles off the Texas coast from Sabine Pass, cuts the 2½-hour boat trip between headquarters on shore and the drilling platform to a 12-minute flight. In a single 3-month period the Model 47G helicopter carried 362 passengers to and from platforms, in addition to delivering needed supplies and parts in a matter of minutes. The 200-hp. craft is shown with pilot Travis Rhodes and mechanic Barney Akins.

Darden Joins Higgins As Assistant to President

A. D. DARDEN

Arthur D. Darden has joined Higgins, Inc., New Orleans, as an assistant to the president, it has been announced by Andrew J. Higgins, Jr., president.

Darden will supervise the processing of new business inquiries and the preparation of bidding plans and specifications, along with other executive duties.

Darden has been a project engineer with the Newport News Shipbuilding & Dry Dock Co., in the hull drafting department. He later became chief engineer of the Welding Shipyards, Inc., Norfolk, Va. In 1951, he was appointed sales manager for the American Shipbuilding Co., Cleveland, Ohio, and in 1953 he became chief engineer, Todd Shipyards Corp., Houston division.

Lane-Wells Names Three To New Field Sales Posts

L. W. Denney, E. C. Adcock, and Ivan E. Wilkerson have been appointed to new posts, it has been announced by J. D. Dunigan, Panhandle district superintendent for Lane-Wells Co.

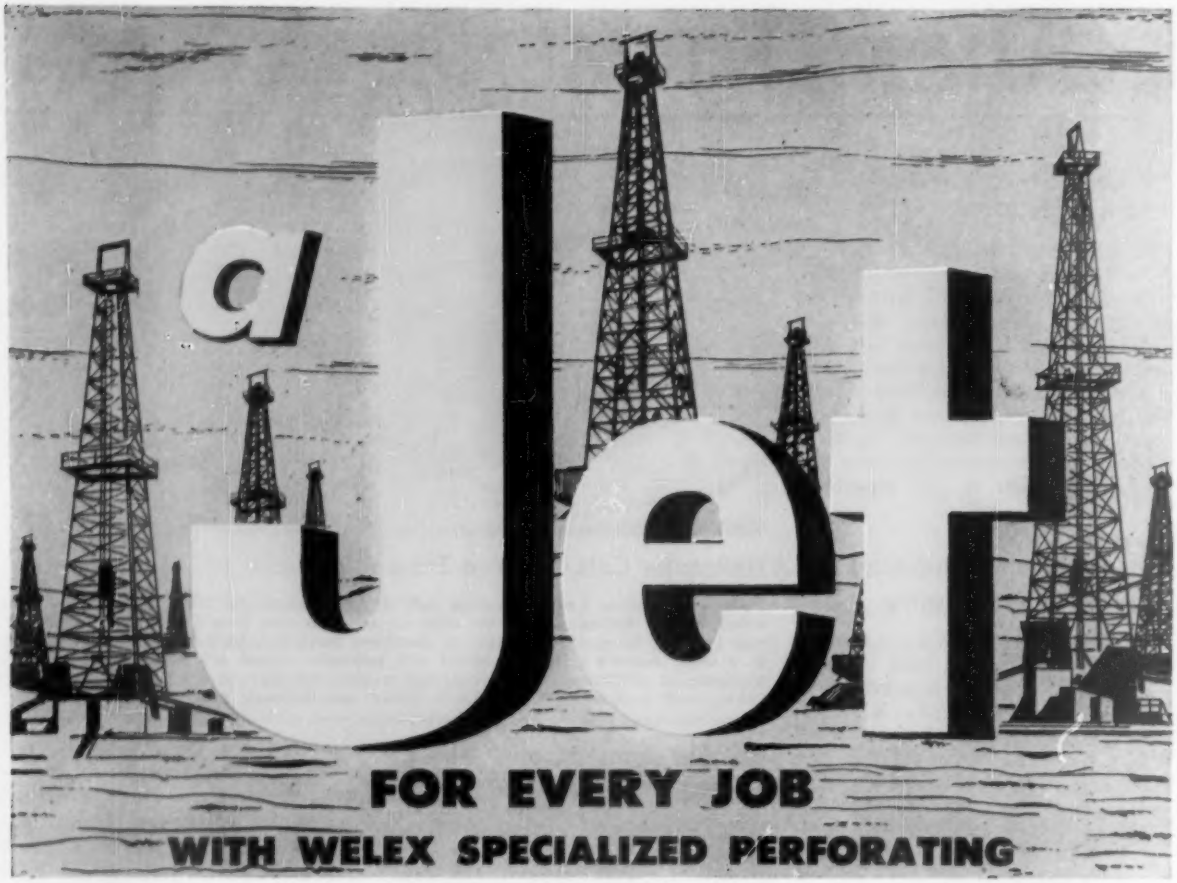
Denney has been appointed subdistrict superintendent for the Pampa subdistrict Panhandle district. He has been with the Lane-Wells Co. since 1948. He joined Lane-Wells as perforating operator and radioactivity well-logging operator in the Pampa, Tex., area. Prior to this appointment Denney had been the district sales engineer at Pampa since 1954.

Adcock and Wilkerson have been appointed district sales engineers for the Pampa subdistrict. Adcock joined Lane-Wells in 1953 in the Panhandle area. Prior to his appointment, he was a radioactivity well-logging operator in Farmington, N. M. Wilkerson has been with Lane-Wells since 1951. Prior to this appointment, he had been working out of the Perry, Okla., branch as a perforating operator.

Smith to Sell Lun-Dow Refined Products

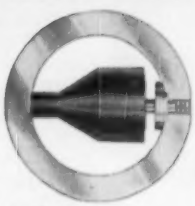
The Lun-Dow Co., Tulsa has appointed Edward S. Smith to its sales staff of its refined-products division. In his new post Smith will be concerned chiefly with new customer development and the sale of refined products as well as the sale and distribution of petroleum products used in the manufacture of finished refinery products.

Smith was formerly employed by an independent marketer of Tulsa and prior to this connection was engaged in the



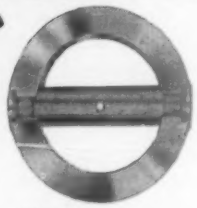
4-Way Jet
For equalizing cement around your casing in squeeze operations!

Torpedo Jet
For maximum penetration and hole size in open hole shooting!



Perfo-Jet
For deep penetration . . . positive perforation without casing or cement damage!

Swing Jet
For maximum penetration in permanent-type well completions!



Twin Jet
For jet advantages and performance at bullet prices!

OIL WELLS . . . just like oil men . . . are individuals. There are few fixed rules that apply to all wells because of the varied conditions encountered during drilling or completion operations. Welex . . . to meet the perforating needs of every well completion job . . . and to give you the *jet* advantages of positive perforation and maximum penetration . . . has developed a full line of specialized perforators and Welex engineers will help you select just the right jet for your well . . .

ORIGINATORS OF JET PERFORATING
Welex JET SERVICES, INC.

Call Welex and be SURE!

General Offices:
1400 E. Berry Street, Fort Worth, Texas
Division Offices:
Midland - Houston - Tulsa - Oklahoma City
District Offices: Abilene - Ardmore - Bartlesville - Beaumont - Corpus Christi - Falfurrias - Farmington - Gainesville - Great Bend - Hobbs - Houston - Lafayette - Liberal - Odessa - Pampa - Paula Valley - San Angelo - Shawnee - Snyder - Stillwater - Wichita Falls - Winfield

marketing of refined products with a major oil company.

Smith's headquarters will be in the home office in Tulsa and he will represent Lun-Dow throughout the Southwest. His appointment is part of the expansion program planned in the Southwest.

French, Adams, Gould Shifted by Union Tank

L. L. FRENCH

Louis L. French has been appointed branch manager of Williston, N. D., branch of Union Tank & Supply Co. of Houston. In addition, Norwick O. Adams, Jr., has been appointed sales and service representative at Houston, and John C. Gould has been appointed sales and service representative at

N. O. ADAMS

J. C. GOULD

Union Tank's new branch office in Odessa.

French has been a sales and service representative at Alice, Tex., for the past 2 years. Before joining Union Tank, he was a perforating engineer at Spartan Tool & Service Co. Adams was a sales representative for Southern Life & Health Insurance Co. before joining Union Tank, and Gould was an office and warehouse man for National Tank Co.

Iverson Announces Several Sales Staff Appointments

The following promotions have been announced by S. J. Iverson,, president of Iverson Supply Co., Tulsa: Frank W. George, formerly floorman, Oklahoma City, to field salesman, Sherman, Tex.; Fred M. (Pat) Knieff, formerly city salesman, Dallas, to district manager, Dallas, and North Texas; and B. H. Watson, formerly field salesman, Snyder, Tex., to store manager, Snyder.

Transfers are: David Crichton, Jr., formerly store manager at Snyder, to Sherman as store manager; A. M. Iverson, Jr., formerly store manager at Price, Utah, to field salesman, Sher-

Why
do most users
prefer and buy the genuine
RIDGID
PIPE WRENCH?

It's easiest to work with... perfect balance . . . comfort-grip I-beam handle . . . handy pipe scale on hookjaw . . . easy-spinning adjusting nut . . . clean grip on pipe, no slip or lock.

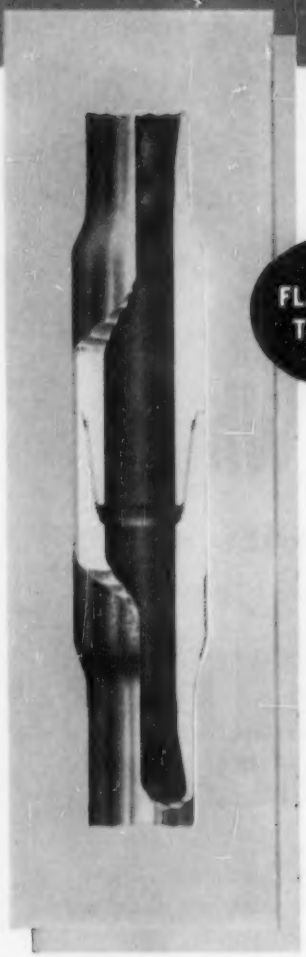
It lasts longer... first guaranteed housing, won't break or bind . . . ever. Every wrench individually tested before shipment . . . and millions of them in use. Sizes 6" to 60"—end pattern, 6" to 36".

For the most for your money, buy RIDGID . . . Your local Supply House stocks them for you, delivers them fast!

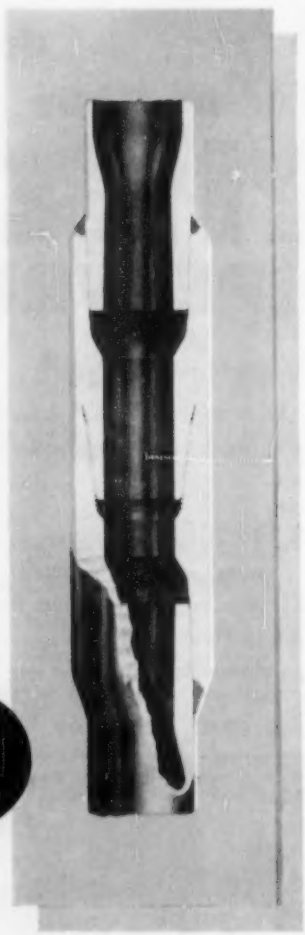
THE RIDGE TOOL COMPANY • ELYRIA, OHIO, U. S. A.

RIDGID
Work-Saver Pipe Tools

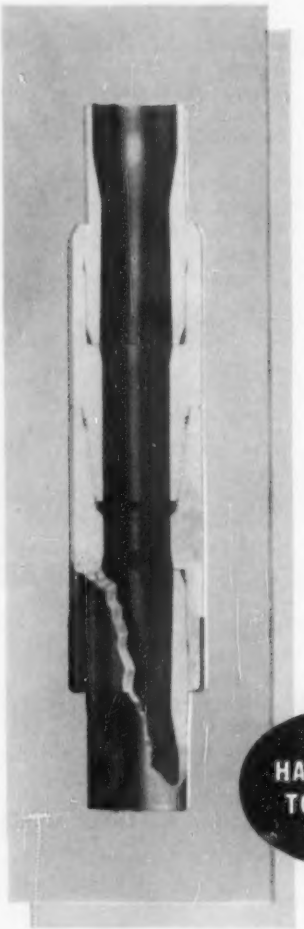
It's the TOOL JOINTS *that count...*



FLASH WELDED TO THE PIPE



COUNTERBORE WELDED TO THE PIPE

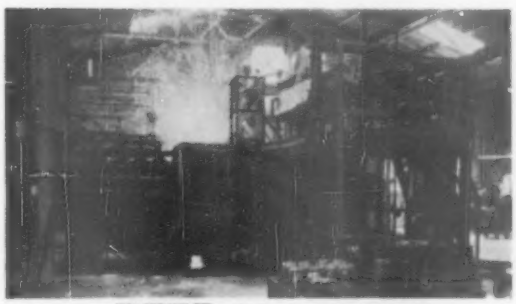


HAND APPLIED TO THE PIPE

REED

when you buy a new drilling string!
and **REED TOOL JOINTS**
last longer!

REED *Super Shrink-Grip* **TOOL JOINTS**
APPLIED BY HAND – ANYWHERE



REED TOOL JOINTS
FLASH WELDED TO THE DRILL PIPE ON MODERN MACHINES BY SKILLED OPERATORS

REED TOOL JOINTS
COUNTERBORE WELDED TO THE DRILL PIPE BY THE 45° ANGLE, 3 BEAD PROCESS

When you order a new string, you are looking for two things . . .

The best tool joints that your money can buy . . . and a pipe connection that will give you the service and economy that your needs dictate. Above all, you want *good tool joints.*

Our one hundred and twenty continuous tool joint inspections throughout the manufacturing process assure you the safest tool joints that money can buy. Continuous, automatically controlled heat treating gives a uniformity that no other method can equal.

When you buy your next string, specify **REED** Tool Joints. We can furnish any type pipe connection you desire.

Ask a REED representative, or write the Company for further information on why **REED** TOOL JOINTS LAST LONGER.

ROLLER BIT COMPANY

HOUSTON 1, TEXAS

Gulf Coast, Mid-Continent, Rocky Mountain and Canadian Distributor for Martin-Decker Products

an ACCO product

Helicoid Gages

For day-in, day-out Sustained Accuracy —for the life of the gage— HELICOID Quality costs you less!

• It's the basic design of HELICOID Gages that makes them outlast and out-perform ordinary gear-tooth gages. This enduring accuracy is evidenced by the smooth rotation of simple spiral roller and cam.

If you use gages it will pay you to investigate HELICOID performance records. There is a HELICOID long-life gage to meet every type of pressure indicating requirement. Ranges are to 20,000 p.s.i. and vacuum or compound.

Write today for Helicoid G-2 Catalog

Dials may be black, white or radiant.

Wall or stem mounting cases—flush panel or flangeless cases.

ACCO

Helicoid Gage Division
AMERICAN CHAIN & CABLE

929-A Connecticut Avenue • Bridgeport 2, Connecticut

Pressure • Vacuum • Compound

man; John B. Tabor, formerly floorman at Odessa, to floorman, Sherman; D. V. Christensen, formerly floorman at Farmington, N. M., to floorman, Sherman; and James C. Ballard, formerly bookkeeper at Snyder, to bookkeeper, Sherman.

William R. Thompson, formerly store manager, Republic Supply Co., Farmington, N. M., has been appointed field salesman, Farmington.

Peerless Names Nickel, Olson to New Sales Posts

Announcement has been made of the appointments of Carl L. Nickel as product sales manager, water systems

CARL L. NICKEL

N. C. OLSON

and dealer-line products, and Norman C. Olson as product sales manager, engineered-line products, by Peerless Pump Division, Food Machinery & Chemical Corp.

Both Nickel and Olson have been with FMC's Peerless Pump Division since 1946. Nickel was previously a product sales manager and Olson was previously branch manager of the firm's Chicago office.

Tellepsen Petro-Chem Appoints Process Engineer

A. M. CUELLAR

Adolph M. Cuellar, senior chemical engineer at American Republics Corp. since 1952 has been appointed process engineer at Tellepsen Petro-Chem Constructors, a division of Tellepsen Construction Co., Houston. Emory E. Gose, Jr., vice president, announced the appointment recently.

In his former job, Cuellar engaged in operational problems of gasoline plants and economic studies related to the most economic methods of producing proven gas reserves. In his new position at Tellepsen, he will specialize in petroleum and gas-gasoline plants.

Prior to joining American Republics Corp., he was process engineer with Gasoline Plant Construction Co. for 4 years, specializing in the design and

Sargent PUMPS

engineered to lift more oil per day at lower costs per barrel

Recognized leader in the development of bottom-hole production pump design, Sargent leads the field in pump engineering, combined with research and manufacturing skill to build pumps that put more oil in your tanks every day, month after month, with minimum maintenance and at lower cost per barrel.

SERVICE Sargent recognizes the importance of pump maintenance and provides the most complete service facilities in the industry. This service is always available through Sargent sales and service stores conveniently located throughout the oil country and staffed by company-trained pump experts.

On the basis of performance and service, Sargent pumps give you more for your money.

Write for complete details.

Sargent, who originated the Insert Rod Sectional Liner Pump, once again offers the latest and best method of pumping oil, through its development of the Sargent Rodless Hydraulic Pump. This pump puts the long stroke unit at the bottom of the well, where it belongs, to operate hydraulically the time-proven standard bottom-hole pump. Rod problems and tubing wear are eliminated. The ultimate in gas compression ratio (elimination of gas lock) is thus obtained with this unit because pump valves are accurately spaced before the pump is run into the well.

Standard Sargent API pump parts facilitate service maintenance of the rodless pump, which can be repaired in any of the Sargent sales and service stores.

SALES & SERVICE

CALIFORNIA
Long Beach
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Santa Maria
Ventura • Taft
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OKLAHOMA
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Pawhuska
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NEW MEXICO
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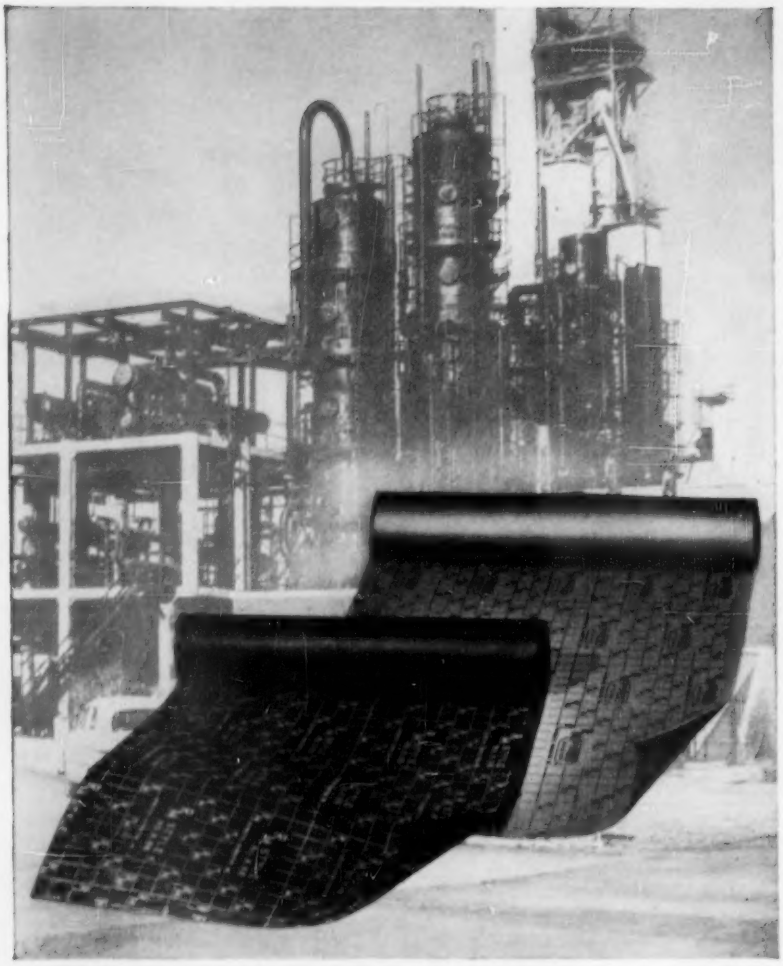
"GOOD WILL" is the disposition of the pleased customer to return to the place where he has been well treated.
U. S. Supreme Court



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Both of the sheet packings shown above have proved their ability to meet the needs of the petroleum industry. Specify them when you order from your distributor and you will get the quality performance you want. **R/M No. K-68®** is for sealing petroleum products and solvents of the gasoline and aromatic types. **R/M "Pyroid"® No. 650** is for sealing oil, steam, acids, alkalies, gasoline-type solvents, and oils at high temperatures. The construction of both is truly homogeneous —providing a dense but pliable sheet of exceptional tensile strength.

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PACKING DIVISION, PASSAIC, N.J.

FACTORIES: Bridgeport, Conn.; Manheim, Pa.; No. Charleston, S.C.; Passaic, N.J.; Neenah, Wis.; Crawfordsville, Ind.; Peterborough, Ontario, Canada

RAYBESTOS-MANHATTAN, INC., Packings • Asbestos Textiles • Industrial Rubber, Engineered Plastic, and Sintered Metal Products • Abrasive and Diamond Wheels • Rubber Covered Equipment • Brake Linings • Brake Blocks Clutch Facings • Fan Belts • Radiator Hose • Bowling Balls

construction of cycling and natural-gasoline plant and compressor stations in the Gulf Coast area.

Nelson Electric Names Fosse to Tulsa Area

R. A. FOSSE

Richard A. Fosse has been promoted to the position of sales engineer for Nelson Electric Manufacturing Co., according to R. S. Terhune, sales manager for Nelson.

Fosse will work out of the Tulsa office and will service customer accounts in the metropolitan Tulsa area. Fosse has worked for Nelson for 2 years in the estimating and quotation section.

Data Reduction System To Monitor Modern Refinery

Fischer & Porter Co., Hatboro, Pa., has contracted to build the world's largest industrial-data-reduction system for the new Canadian Petrofina, Ltd., refinery soon to go into operation in Montreal, Canada.

The planned automatic logger, a $50,000 installation, will automatically monitor, analyze, and record a total of 480 process variables for all the production units at the Canadian refinery.

In terms of scope of operation, the system will assure complete elimination of routine checking by control personnel and will guarantee accurate records even during the hectic times of refinery upsets. Robert Stern, vice president in charge of Fischer & Porter's data reduction and automation division, has termed the Petrofina data-reduction system the biggest single step to date toward complete process-industry automation.

Petrofina plans to operate its entire refinery from a single, central control room which will house 126 ft. of instrument panel board containing hundreds of conventional meters and recorders.

Also located in the control room, the compact automatic logger will have the task of continuously watching all 126 ft. of panelboard.

Under normal conditions the unit will automatically type out on a single log sheet the value of all variables each hour on the hour.

Between logging intervals, the logger will continue to scan all variables, reporting only selected or abnormal conditions. In case of trouble, the logger signals an alarm and immediately types

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is "ON THE BEAM"

with TWO-WAY RADIO

Mobile units installed in Oklahoma is the beginning of a more efficient and faster oil field supply service.

It's a big step forward in an already superior oil field supply service. We have shortened the time and distance between your rig and your United Supply store to give you the very best service in the field. It's another good reason to "rely on United Supply!"

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Stores in: KANSAS, OKLAHOMA, TEXAS, LOUISIANA, AND NEW MEXICO

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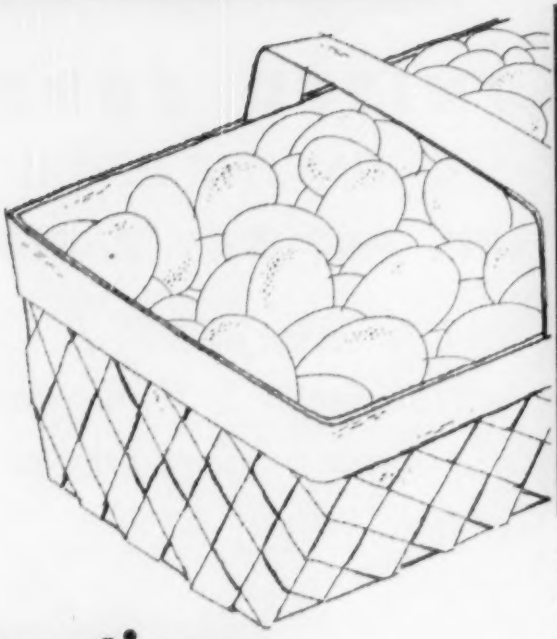
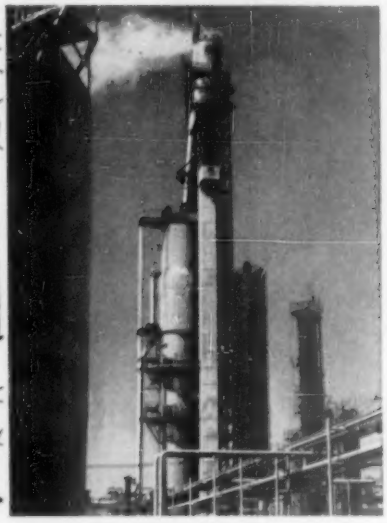
Capsule Case History:

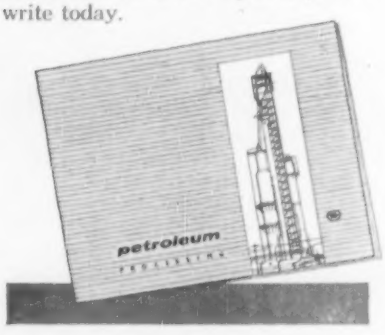




A Packaged Project
this modern moving-bed Houdriflow cat-cracker was designed and built by Kaiser Engineers for a major southwest petroleum refinery. This unit operated 13 months without a shutdown after first going on stream.

Responsibility for All Phases
of design, engineering, procurement and construction is another feature of the services available to your firm from the KE team of specialists.

The KE petroleum brochure (No. 103) —which features this refinery addition will be mailed to you upon request—write today.



Sometimes it pays...

Kaiser Engineers, a close-knit team of specialists, is staffed to handle every phase of your project. Their work in widely divergent fields of design and construction offers plenty of proof that it pays to put all your project eggs in this one basket.

kaiser engineers ...for low operating costs

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• HENRY J. KAISER CONSTRUCTION CO. • HENRY J. KAISER COMPANY (Canada) LTD., MONTREAL • KAISER ENGINEERS INTERNATIONAL, INC.

the out-of-line condition and its location.

In addition to recording raw data, the logger will automatically compute and record more complex factors of interest to refinery-operating personnel such as total flow, efficiency ratios, and yield factors.

The automatic logger will also punch significant data directly into paper tape or cards to facilitate subsequent analysis by Petrofina's accounting and engineering departments and speed preparation of summary reports to management.

Otis Appoints Robbins As Service Manager

Kenneth W. Robbins has been appointed service manager to supervise and direct all service operations for Otis Pressure Control, Inc., Dallas.

Robbins began working for Otis in 1946 as a wire-line helper in the Houston division. Since then he has worked as a tubing helper, wire-line operator, office manager, caliper engineer, and chief corrosion-analysis engineer. In 1952 Robbins was transferred to Dallas as a consulting engineer in the sales department. Later he was named service-office manager.

Oilwell Names Five Field Men in Central Midwest

The appointments of Edward Dwayne Andrus as field representative at Anson, Tex., J. R. Canon as field representative at Hobbs, N. M., Gorman T. Horton as field representative at Greggton, Tex., and the transfer of Wylie P. Wright, Jr., to Denver City, Tex., and Donald E. Kyle to Gainesville, Tex., have been announced by William Miskimins, Central Midwest area manager for U. S. Steel's Oil Well Supply Division.

Andrus was employed by Oilwell in 1952 as storeman at Anson and served in that capacity until his present appointment.

Canon joined Oilwell in 1950 as a storeman at the Abilene store. He left the division for awhile, then returned in 1953 as a storeman at Hobbs where he was located until his present appointment.

Wright was employed by Oilwell in 1949 at Odessa. In 1950 he was transferred to Hobbs where he was appointed field representative in 1952.

Horton was employed in 1954 at

When It Comes to Coupling Pipe

It Pays to Know the Facts About

GUSTIN gb BACON

What's the Big Advantage in G-B Couplings?

G-B couplings eliminate flanging, threading, welding. No special tools or skill required to install them. Result: Tremendous savings in installation time.

How Else Do They Save Money?

All G-B couplings are reclaimable. Also, with G-B couplings, every joint is a union. Makes it easy, inexpensive to take a line apart.

How Much Abuse Can They Take?

Because they permit end pull up to 102,000 and misalignment up to 7°, G-B couplings absorb shock, vibration, ground motion, expansion, contraction, etc.

Are They Recommended for Permanent Installations?

Thousands and thousands of G-B couplings installed years ago on permanent lines, buried and exposed, are still giving completely satisfactory service.

What Kind of Lines Are They Used On?

Oil, water, chemicals, gases, air, processing fluids, abrasive materials. Permanent or temporary lines, surface or buried, vacuum, suction or discharge, vertical or horizontal.

ROLAGRIP

for plain end pipe, 1¼" to 12", 1000 p.s.i.

GRUVAGRIP

for grooved pipe, ¾" to 18", 1000 p.s.i.

GRUVAJOINT

for grooved pipe, 2" to 6", 500 p.s.i.

FITTINGS

for all Gruvagrip and Gruvajoint couplings.

Get gb Couplings at your supply store

GUSTIN-BACON Manufacturing Company

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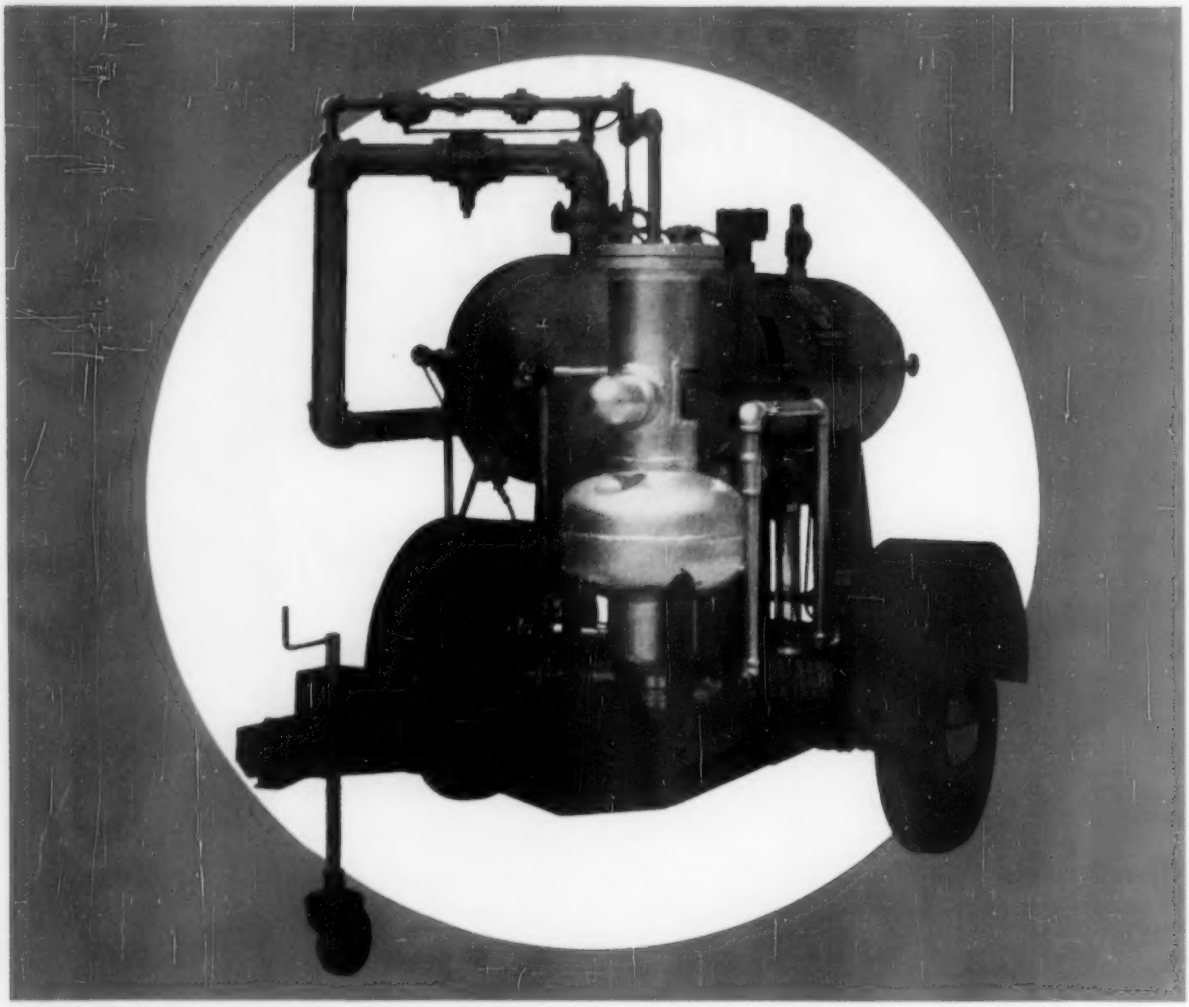
Write today for brochure #55-K containing photos, specifications on all G-B coupling products, including aluminum couplings and fittings for grooved pipe.

THE ROLO WELLCHECKER HAS A NEW LOOK



Yes, the new ROLOCHECK Oil Meter* and Automatic Sampler* have given a new look to the familiar Rolo units—a new look that means unbelievable accuracy and maintenance-free operation in crude oil metering and sampling. The ROLOCHECK meter vessel is *shaped* for accuracy, and its simple internals defy wear and clogging.

And, an automatic free water knock-out using the ROLOCHECK water meter is available on Rolo Wellcheckers.

*Patents issued and pending

Write for full information on Rolo Wellcheckers with ROLOCHECK meters. These units separate and meter the oil, water and gas produced by a well or group of wells. Send particulars about your operating conditions, and we will be glad to offer the unit, either skid-mounted or trailer-mounted, for your needs. Or, contact your local Rolo representative.

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5776

Greggton as a storeman for Oilwell and served in that capacity until his present appointment.

Kyle was employed at Anson as storeman by Oilwell in 1951. In 1954 he was appointed field representative at Anson and was located there until his present transfer.

Dresser Announces Foreign Operations Expansion

R. HATCHITT

Expansion of Dresser Industries, Inc., and its various operating companies and foreign subsidiaries, and appointment of a foreign director to set up and direct an expanded overseas - operations department, was announced by J. B. O'Connor, executive vice president of Dresser Industries, Inc., Dallas.

This announcement follows closely upon a recent meeting in New York City of the executive staff of Dresser Industries, Inc., and its subsidiary companies engaged in foreign and export work. The meeting was held to review world markets and program operations plans for Dresser's expansion in the foreign field.

As director of these overseas operations, Dresser has named Reece Hatchitt, who formerly handled the company's foreign legal affairs. Hatchitt has been engaged in foreign and export work for 15 years. He was formerly associated with American and Foreign Power Co. operations in Latin America, served in the Foreign Economic Administration in Chile, and is experienced in both domestic and foreign sales and organization.

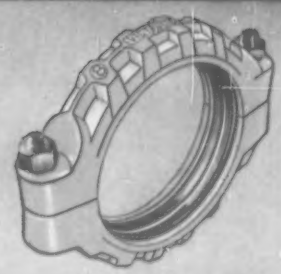
Ketner Is Vice President General Manager, Delta

The appointment of Joe E. Ketner as vice president and general manager and the election of three other vice presidents was announced by Hal S. Phillips, president of Delta Tank Manufacturing Co., Inc.

The new vice presidents include Ross B. Baze, sales manager of Delta's oil-field equipment and special-order products division; Max Fetty, advertising and sales promotion manager; and Jack Harelson, manager of Delta's Macon, Ga., plant.

Ketner joined Delta in 1946 and later was appointed sales manager. He was named vice president in charge of sales in 1952 and subsequently was elected to the board of directors of

VICTAULIC METHOD OF PIPING



VICTAULIC COUPLINGS

Styles 77, 77-D for standard applications. Simple, fast to install—sturdy and reliable. Sizes ¾" to 30". Style 75 Light-Weight Couplings for light duty applications. Sizes 2", 3", 4". Additional styles for cast iron, plastic and other pipes. Sizes through 60".

VICTAULIC FULL-FLOW FITTINGS

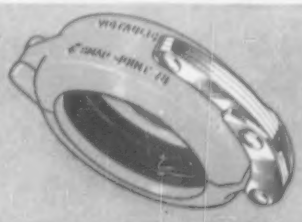
Complete line of Elbows, Tees, Reducers, Laterals, etc.—to fit all Victaulic Couplings. Streamlined for top efficiency, easy to install. Sizes ¾" to 12".

VIC-GROOVER TOOLS

Handy, on-the-job grooving tools that do the work in half the time. Light weight, easy to handle—operate manually or from any power drive. Automatic groove position and depth. Sizes ¾" to 8".

ROUST-A-BOUT COUPLINGS

Style 99 for plain or beveled end pipe. Best engineered, most useful plain end joint on the market. Simple, husky — easy and fast to install. Takes strong bull-dog grip on pipe. Sizes 2" to 8".



VICTAULIC SNAP-JOINTS

Victaulic's new boltless, speed coupling. — Style 78 — hinged into one assembly. Hand-locks for time and dollar savings. Sizes 1", 1¼", 2", 3", 4".

EASIEST WAY TO MAKE ENDS MEET

Promptly available from distributor stocks coast-to-coast. Write for NEW Victaulic Catalog-Manual 55-7E.

VICTAULIC COMPANY OF AMERICA

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PROMPT, DEPENDABLE MUD ENGINEERING SERVICE WHEREVER YOU DRILL

This location could be in California, Oklahoma or any other oil producing area . . . because there is one thing common to every drilling location in North America: prompt Magcobar drilling mud service. And Magcobar engineers gladly accept the fact that oil well drilling is a 24-hour a day business.

Year after year, Magcobar has trained and equipped scores of additional field engineers to help with your drilling mud problems. Every year, Magcobar has continued to improve and add new products to meet specialized conditions. Today, you can get the best field mud engineering service . . . from Magcobar . . . that has ever been provided to the oil industry.

Keep the Magcobar man's number handy. You can reach him by phone day or night.

MAGNET COVE BARIUM CORPORATION
ONE OF THE DRESSER INDUSTRIES
HOUSTON, TEXAS

General Gas Corp., Delta's parent company.

Baze began his career as an engineer for the Sinclair-Prairie Oil Co. and was active as West Coast division sales manager of an oil-field equipment firm before joining Delta.

Fetty joined Delta in 1950 after serving as an executive of Radio Station WAFB of Baton Rouge. He earlier was affiliated with Stations WIRE of Indianapolis and WJBO of Baton Rouge.

Harelson joined Delta's staff in 1945 and was appointed general manager of its Macon plant in 1949.

Morse Chain Names Spicer Vice President, Sales

D. H. SPICER

The appointment of Donald H. Spicer as vice president in charge of sales has been announced by Stanley J. Roush, president and general manager of the Morse Chain Co., a Borg - Warner industry. Spicer will direct all industrial and automotive sales activities of the Detroit, Mich., and Ithaca, N. Y., plants of the company, as well as those of the newly-formed Canadian division, Morse Chain of Canada, Ltd.

Spicer was formerly vice president of sales for American Bosch Arma Co. and, prior to that, was president of World Bestos Corp., a division of Firestone Tire & Rubber Co.

Rockwell Moves Barnett to New Meter, Valve Post

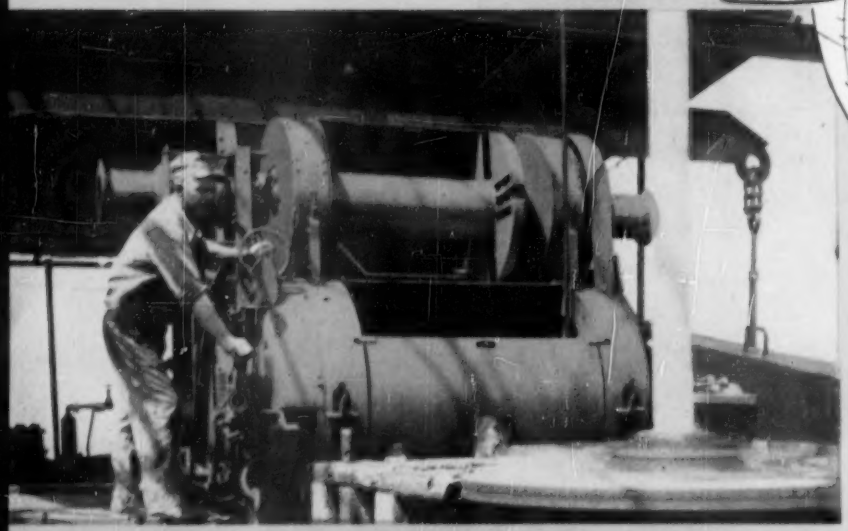
O. W. BARNETT

Orville W. Barnett, manager of Nordstrom valve distribution and oil-field sales for Rockwell Manufacturing Co., has been named assistant to the vice president, Meter & Valve Division.

Barnett will move to the new Rockwell valve plant at Sulphur Springs, Tex., according to Paul Kreuch, vice president. He will continue to promote and coordinate oil-field sales and will develop a training program for Rockwell and distributor sales personnel and customer representatives.

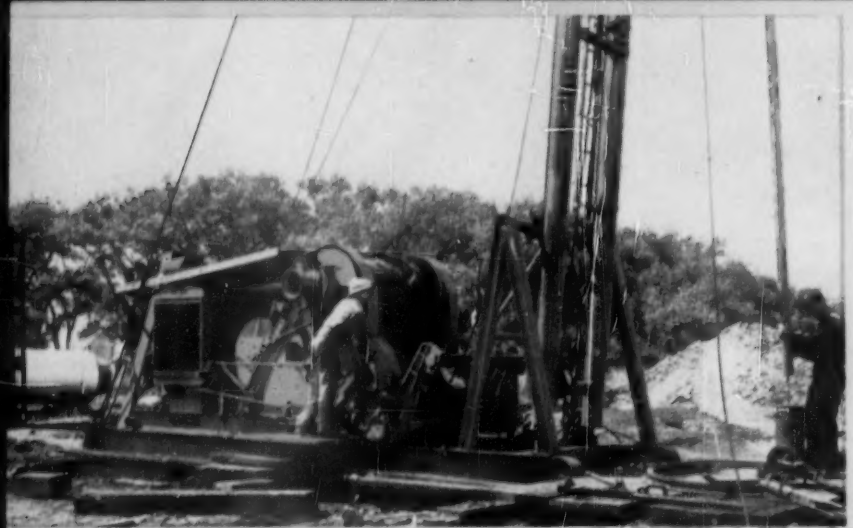
Barnett joined Rockwell in 1934. After several years as a sales engineer in the Tulsa district, he was named gas-products sales supervisor for that district in 1947. In 1950, he was trans-

CARDWELL MODEL R
are the Standard

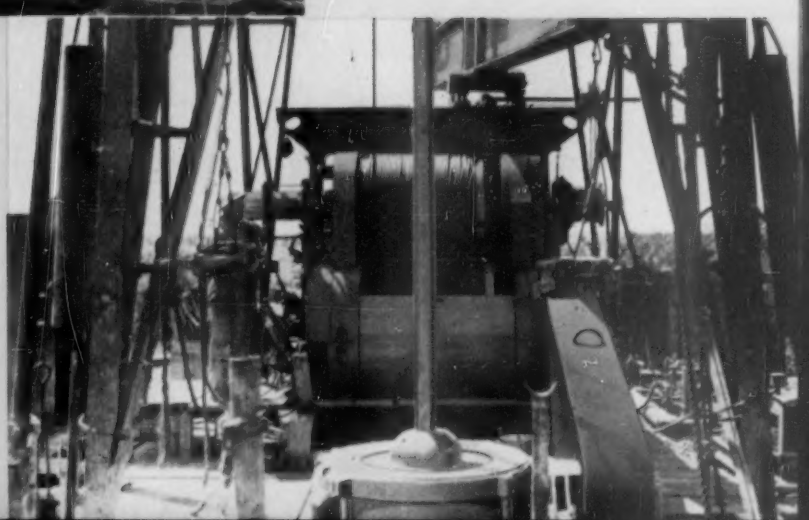


LOWEST PRICED
Double Drum, 4,000' Draw Works
Price $23,030.00, F.O.B. Wichita
Including WAK 190-HP Waukesha, American Automatic Cathead, and Cardwell 5-Speed and Reverse Transmission. Good for 8,000 feet Slim Hole. Terms, if desired.

Rotary drilling with 4½-inch drill pipe to 4,859 feet in Oklahoma.



Double drum with spudder and 65-foot telescoping mast on drilling-in job.



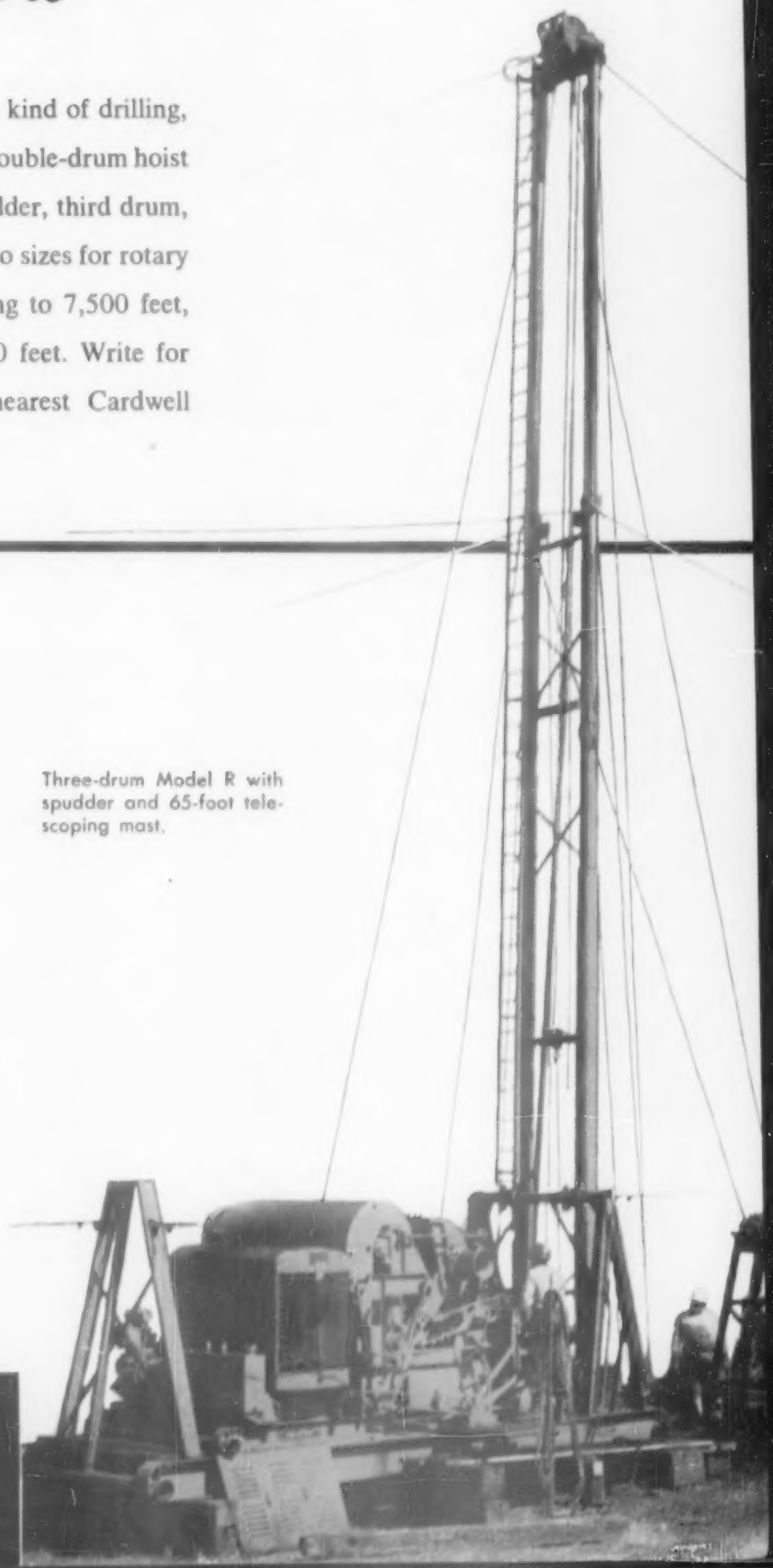
Model R equipped with both beam assembly and rotary table drive doing rotary drilling. With no change in equipment, this outfit can immediately switch to cable tool operations, making it the most versatile rig in the world.

combination rotary and cable tool rigs *of the World*

This Cardwell rig can be used on every kind of drilling, servicing, and workover job. The basic double-drum hoist can be equipped with rotary drive, spudder, third drum, or beam assembly, and is available in two sizes for rotary drilling to 5,000 feet, cable tool drilling to 7,500 feet, servicing and workover jobs to 10,000 feet. Write for complete information, or see your nearest Cardwell representative.

"Drill in" your wells with cable tools to insure a well in low-gas pressure areas. This practice is as "old as the hills," but it's still good procedure.

In wildcat territories, a Cardwell combination rotary and cable tool rig will lower your initial investment. After the drilling program is finished, the same rig will serve year after year as a workover rig for both rotary and cable tools.



Three-drum Model R with spudder and 65-foot telescoping mast.

There is a Cardwell representative and a parts stock dealer near you. Write or wire Cardwell Mfg. Co., Inc., Wichita, Kansas, for name and address.

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Used by leading petroleum processors for flange bolts, studs and all other threaded surfaces on reactors, cat crackers, heat exchangers, pumps and valves, etc.

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C-5 FEL-PRO "HI-TEMP" ANTI-SEIZE THREAD COMPOUND

Fel-Pro's exclusive C-5 colloidal-copper formula "copper-plates" metal, protects to 1800°F without breakdown. Reduces torque. Prevents galvanic pitting even where dissimilar metals are joined.

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For the quickest, proven method of prospecting — from aircraft . . . The RADIAC Company recommends the up-to-the-minute "CARDINAL"—$2420.00

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For prospecting from a moving vehicle — the "NUCLEOMETER"—$545.00

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For accurate gamma ray measurements in drill holes down to 4000 feet for Oil or Uranium—the Super Sensitive "SCINTILLOGGER"—$2350.00

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ferred from Dallas to Pittsburgh as manager of Nordstrom distributor sales.

Helton Named Manager of Failing of Canada

J. L. HELTON

J. L. (Jimmy) Helton, manager of the branch plant of George E. Failing Co. in Midland, Tex., since 1947, has been made general manager of George E. Failing Supply Co., Ltd., of Edmonton, Alta., Canada, according to an announcement by J. T. Tucker, general manager of sales for Failing. Helton will replace Harry Failing who recently resigned.

Helton started his career with Failing in 1935 as a driller on Failing rigs doing contract work in South Texas. In 1938 he started working for Shell Oil Co. with drilling assignments in Cuba and India. After his discharge from service, he worked as a field representative out of the main Failing plant in Enid, Okla.

BJ Service Names Andrew To Be Sales Manager

O. N. ANDREW

The following promotions have been announced by BJ Service, Inc., vice president in charge of sales, Frank D. Smith.

Owen N. Andrew has been appointed to the newly established post of sales manager. Andrew was previously Pacific Coast division operations manager.

James T. Streger has been promoted from Pacific Coast division sales supervisor to Pacific Coast division manager of operations.

C. Z. Hughes has been advanced to station superintendent of the Long Beach district.

McCullough Announces Kimball Service Branch

The McCullough Tool Co. has opened a new service branch in Kimball, Neb., according to an announcement by I. J. McCullough, president. Complete service facilities are being established to serve the oil industry in the area.

V. J. Sanders has been appointed manager of McCullough's new Kimball branch. An oil-field veteran, Sanders

RATIGAN No. 91 sucker rod hooks

With or Without Spring.

Short, Medium or Long Interchangeable Bail.

Ratigan Hooks are designed to balance a stand of rods so one man can lift or pull down the stand as desired. Point of hook is extended beyond front of body . . . man hooking on never misses. Fast, safe operation is assured with Ratigan Hooks.

SOLD THROUGH LEADING SUPPLY STORES EVERYWHERE

J. P. RATIGAN, Inc.

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ALLOY STUDS to your specifications

For better alloy fastenings, try VICTOR—over 30 years of service to the petroleum industry. Prompt quotations furnished.

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VICTOR PRODUCTS CORP.

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M-SCOPE PIPE FINDER

"ELECTRONIC WITCH"

HEAVY DUTY PERFORMANCE

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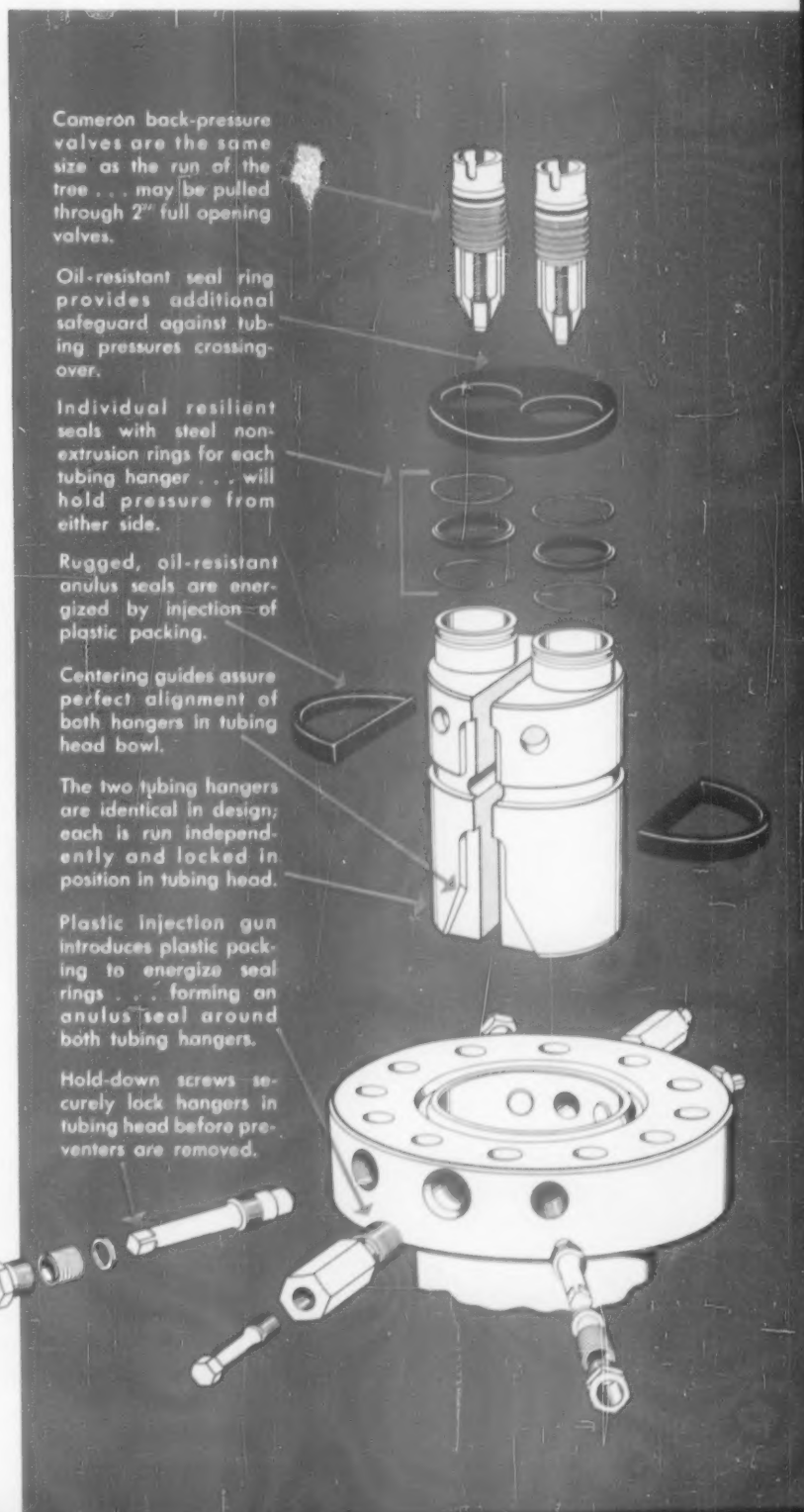
CAMERON "DC"

DUAL COMPLETION TREE

In the Cameron "DC" Dual Completion Method, either string can be run in precisely the same manner as a single zone completion . . . they can be run or pulled independently or simultaneously. And at no time during completion operations does the Cameron "DC" equipment leave the well open. Each tubing string is suspended, locked securely in the tubing head, and sealed before preventers are removed. The tree may then be installed and flowline connections made before removing the Cameron back-pressure valves and washing the well into production.


Cameron back-pressure valves are the same size as the run of the tree . . . may be pulled through 2" full opening valves.
Oil-resistant seal ring provides additional safeguard against tubing pressures crossing-over.
Individual resilient seals with steel non-extrusion rings for each tubing hanger . . . will hold pressure from either side.
Rugged, oil-resistant anulus seals are energized by injection of plastic packing.
Centering guides assure perfect alignment of both hangers in tubing head bowl.
The two tubing hangers are identical in design; each is run independently and locked in position in tubing head.
Plastic injection gun introduces plastic packing to energize seal rings . . . forming an anulus seal around both tubing hangers.
Hold-down screws securely lock hangers in tubing head before preventers are removed.

Cameron

IRON WORKS, INC.

P. O. Box 1212, Houston, Texas

Export Office: 7912 Empire State Bldg., New York City. In England: British Oilfield Equipment Co., Ltd., Time & Life Bldg., New Bond Street, London W. 1 England.

"Why was that young roughneck peeling potatoes on the derrick floor?"

"He was spudding in."

Joe Roughneck is the guy who gets the job done in the oil industry. He may be on a rig in the oil field or directing far flung operations from a plush office . . but he knows oil . . and pipe . . and he's the backbone and the symbol of the petroleum industry.

For Joe's personal convenience . . Lone Star's completely integrated steel mill is turning out API casing, tubing and line pipe of the highest quality. Joe likes to do business with the home folks at Lone Star where the largest mill stock in the Southwest is maintained and fast delivery is routine.

Neighbor, wherever you are, specify Lone Star and we both get a good deal!

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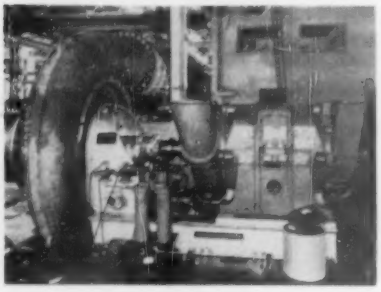
DISTRICT SALES OFFICES
Houston, Texas | Midland, Texas | San Antonio, Texas
Tulsa, Oklahoma | Wichita Falls, Texas | Shreveport, La.

has worked in McCullough sales and service locations throughout the Rocky Mountains as well as in California, Louisiana, Texas, and western Canada. The new branch is fully staffed with experienced personnel trained in the use of all McCullough tools and services.

American Blower Compressor Is Installed at Refinery



An outdoor, 43,000 cu. ft. per minute American Blower centrifugal compressor, direct-coupled to an ACEC 1,250-hp., 3,600-r.p.m. electric motor, is being installed in the Petrofina refinery now under construction at Pointe Aux Trembles, Quebec. The compressor will serve as combination air lift and combustion blower for the refinery's 16,000 bbl.-a-day Houdriflow catalytic cracking unit, scheduled to go on stream late this summer.

The compressor and motor are shown undergoing preinstallation tests. The compressor was supplied by Canadian Sirocco Co., Ltd., to Lummus Co. of Canada, Ltd., which is building the refinery for Canadian Petrofina, Ltd. The motor was supplied by ACEC Electric Corp.

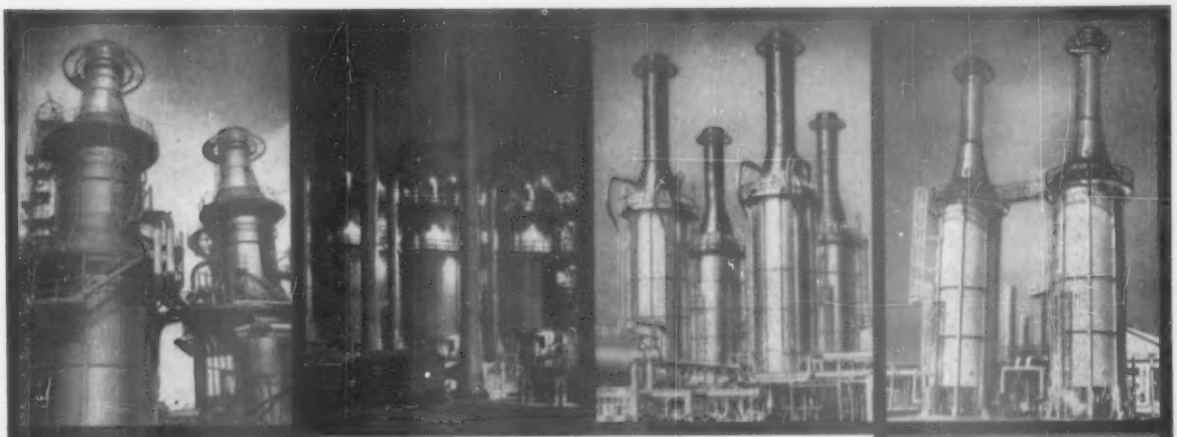
Daniel Orifice Fitting Completes Houston Plant

Daniel Orifice Fitting Co. recently completed and formally opened its new Houston facility at 9720 Katy Road. The company's Houston plant and sales offices had been located at 5405 Clinton Drive for approximately 15 years.

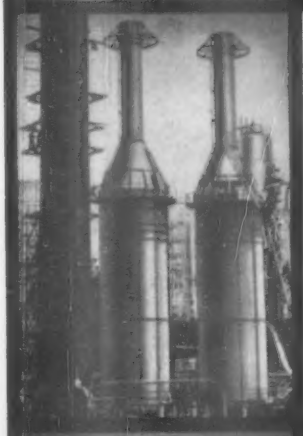
The new site covers 15 acres. Sales and executive offices are housed in a modern office building that takes up 6,000 sq. ft. of space. The new fabricating shop has over 10,000 sq. ft., and the machine shop covers 5,000 sq. ft. Complete warehousing facilities use an additional 5,000 sq. ft. of space.

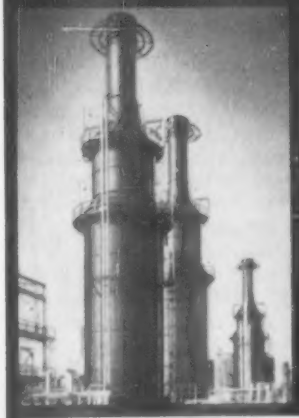
The Houston plant and sales offices are presided over by W. A. Griffin, vice president and general sales manager of the company.

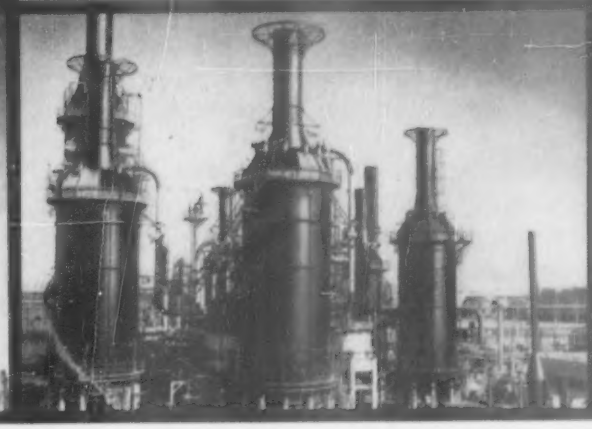
Members of the board attending were: Paul P. Daniel, chairman; J. G.



100 MILLION DOLLARS WORTH OF PLANTS FIRED WITH PETROCHEM-ISOFLOW FURNACES







More than 1250 Petrochem-Isoflow Furnaces are in operation throughout the world in the petroleum, chemical and allied industries . . . for all processes and for any duty, pressure, temperature and efficiency . . . and all Petrochem-Isoflow Furnaces are most efficient by any comparison.

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UNLIMITED IN SIZE ... CAPACITY ... DUTY

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Representatives: Bethlehem Supply, Tulsa and Houston • Flagg, Brackett & Durgin, Boston • D. D. Foster, Pittsburgh • Faville-Levally, Chicago • Lester Oberholtz, Los Angeles • Gordon D. Hardin, Louisville • Turbex, Philadelphia

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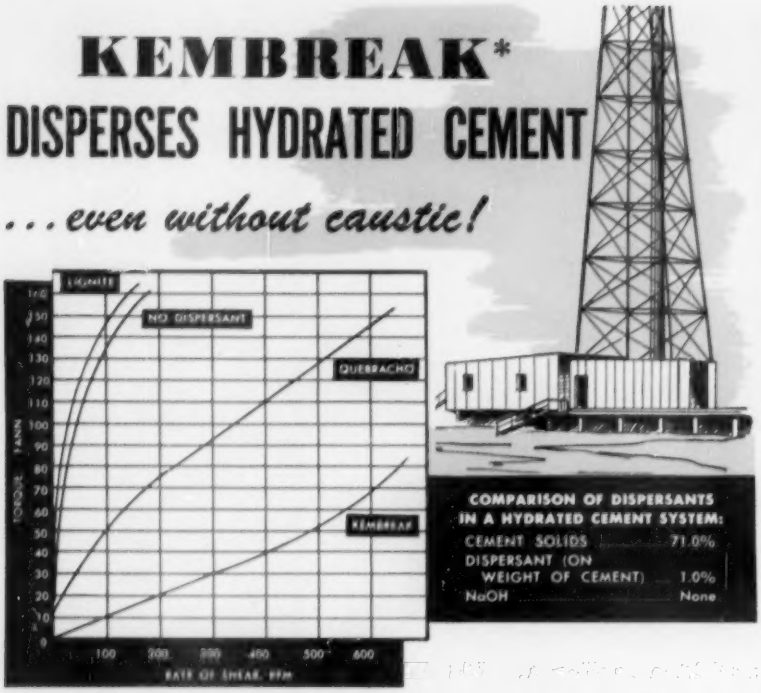
KEMBREAK*
DISPERSES HYDRATED CEMENT
...even without caustic!



The hydrated cement "mud" used to develop these curves certainly won't become tomorrow's drilling fluid. In the laboratory, however, it is one means of clearly illustrating the superiority of Kembreak over other commonly used dispersants in lime treated muds.

*Kembreak is a trade name for Marathon Corporation's neutral calcium lignosulfonate.†

It is the only lignosulfonate product proved by years of successful use in oil well drilling.

†patented

Note how well Kembreak disperses a system having a high calcium ion concentration — without the addition of caustic. And, of course, this dispersant performs equally well in low lime — low caustic drilling fluids and conventional lime base muds.

Kembreak muds are virtually unaffected by the contaminants encountered in normal drilling, e.g.: gypsum, anhydrite, clay, salt, lime, limey shales . . . and cement. Kembreak is a stabilizer, too, for oil-in-water emulsions . . . making it doubly useful in lime treated emulsion muds.

Guard against drilling failures, whenever difficult hole conditions are expected, by using muds made with Kembreak.

KEMBREAK†
may be obtained from

MILWHITE MUD SALES CO.
HOUSTON, TEXAS

MAGNET COVE BARIUM CORP.
HOUSTON, TEXAS

†Reg. T.M., Accuracy Rig Tool Company

MARATHON *Corporation*
CHEMICAL SALES DEPARTMENT
ROTHSCHILD • WISCONSIN

Holdenreid, president; W. A. Griffin; Mrs. Alphonsine Ring, secretary-treasurer; and L. W. Wilbern, West Coast district sales manager.

Cameron Makes Record Air Shipment to Africa

When the Societe de Recherches et d'Explotation des Petroles du Cameroun, Serepca, wildcat venture in French Equitorial Africa blew out of control recently, Cameron Iron Works, Houston, assembled the necessary blowout preventers, valves, and fittings required for the capping manifold and started it on its journey by air. The 18,300-lb. shipment traveled only from Houston to Dallas by truck. There it was transferred to American Airlines and flown to New York City where it was transferred to Pan American and Air France and flown to Paris. The Pan American load was then transferred to Air France and the shipment was flown to Douala.

M. M. Kinley of Houston, wild well-capping expert, is directing the capping directions.

Shaffer Tool to Build Oklahoma City Shop

Donald U. Shaffer, president of the Shaffer Tool Works of Brea, Calif., manufacturer of high-pressure oil drilling equipment, announced today that the company will start immediate construction on an office and warehouse building in Oklahoma City.

The new building is to be located on the Dallas-Oklahoma City Highway 77. The completion arrangements and construction contract were negotiated this past week in Oklahoma City by J. Robert Langston, John Vertson, and Clay Fry, who will be the Oklahoma City manager for Shaffer Tool Works.

Actual construction will begin immediately and completion is expected around the end of this August.

The purpose of the new building will be for sales and service of Shaffer oil tools for all operators and contractors in the Oklahoma area.

Trees to Head Pittsburgh Office for Chicago Bridge

George S. Trees, a director of Chicago Bridge & Iron Co., was recently appointed manager of the company's Pittsburgh sales office. Trees has been with the company since 1936 and, since July 1, 1954, had been assistant general sales manager with headquarters in Chicago.

Additional changes in the sales staff include the following transfers from the general sales office in Chicago: Theodore F. Cocks was transferred to the

Chicago sales office; Jack W. Schultz to the Salt Lake City sales office; and Richard E. Croop to the Boston sales office.

Texas Instruments Opens Los Angeles Sales Office

Texas Instruments, Inc., is opening a Los Angeles sales office as the first step in establishing marketing headquarters throughout the U. S., president J. E. Jonsson has announced. The Los Angeles office will be headquarters for the western district and is the first of several offices scheduled to be opened this year.

Western district office personnel will include William J. Brugman, semiconductor products division; W. M. Montgomery, Jr., components division; and Rex Welch, apparatus division.

W. C. Norris Announces Field Personnel Changes

Several field personnel changes have been announced by E. C. Bolger, president of W. C. Norris, Manufacturer, Inc., Tulsa.

Paul W. Colvard, formerly salesman in the Houston office, has been transferred to Odessa, Tex., as branch manager.

R. E. (Mac) McBurnett is now a sales representative out of the Shreveport, La. office covering south Arkansas, northern Louisiana, and Mississippi. He was formerly with the Wichita Falls branch.

J. A. Getty, formerly sales representative with the Shreveport branch, has been moved to the Wichita Falls branch.

Otto Perryman is now warehouse manager at Wichita Falls, transferring from Kilgore, Tex.

Houdry to Install Iso-Plus Unit at Ravenna, Italy

The first European Iso-Plus Houdriforming unit for production of 100-clear-octane gasoline will be built in Ravenna, Italy, for SAROM, by Houdry Process Corp.

The Iso-Plus 100-octane unit will couple regular Houdriforming and supplemental-thermal reforming in the processing of naphthas from Iraq crude petroleum.

Engineering for the new Houdriformer will be handled by Houdry Process Corp. and the Lummus Co., and construction will be carried out by Breda Electromaconia Locomotive,

D+B DUAL-PAC STUFFING BOX
boosts profits-with less servicing

Compact and efficient, the D+B Dual-Pac Stuffing Box saves you money in reduced maintenance time.

All metal parts are steel or bronze . . . there are no castings to break or leak. The porous bronze gland, impregnated with oil, accurately centers the polished rod, eliminates contact with all other metal parts and reduces wear on the packing.

Dual packing permits replacement of the pressure seal packing without killing the well. By merely loosening the lock nut and screwing down the retainer with the cap, the lower packing is compressed forming a high pressure seal. Well flow is sealed off and upper packing removed without bleeding the head off the well.

Specify the best . . . D+B products. Call CONTINENTAL or your D+B store for service anywhere . . . any time.

D+B
• DEEP WELL PUMPS
• SUCKER RODS
• COUPLINGS

D+B DIVISION
EMSCO MANUFACTURING COMPANY
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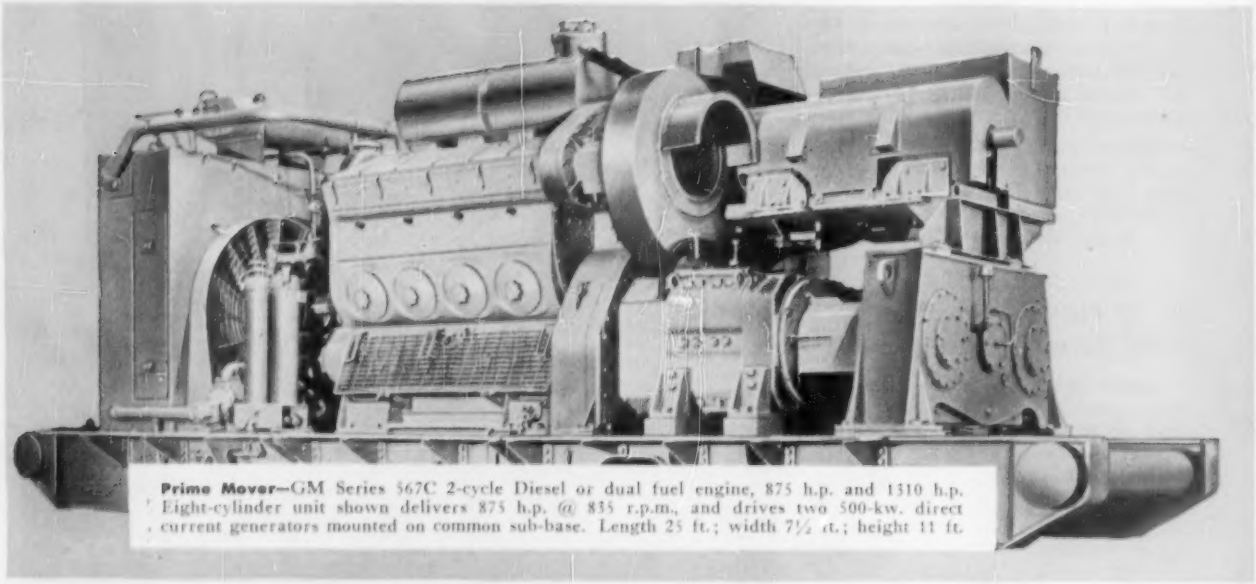
LOS ANGELES, CALIF.
Houston, Texas
General Sales Offices: Dallas, Texas

CONTINENTAL
Serving the Oil and Gas Industries

THE CONTINENTAL SUPPLY COMPANY
General Offices: Dallas, Texas
Representatives in all principal oil fields of the world

C-156-55

Now–a Dependable Diesel—Power Plant made and



Prime Mover—GM Series 567C 2-cycle Diesel or dual fuel engine, 875 h.p. and 1310 h.p. Eight-cylinder unit shown delivers 875 h.p. @ 835 r.p.m., and drives two 500-kw. direct current generators mounted on common sub-base. Length 25 ft.; width 7½ ft.; height 11 ft.

Now you can have the economy of the famous General Motors two-cycle 567 Series engine, in a completely integrated Diesel-Electric power plant that brings new flexibility to oil well drilling on land or offshore.

This powerful General Motors engine (Diesel or dual fuel) drives generators and motors which are basically the same proved components already being mass-produced for General Motors locomotives. Extremely compact and light in weight, these rugged units are individually skid-mounted for easy, fast setups and economical moves.

Power is transmitted by cables equipped with quick connections. No bolts to fasten. No taping needed. No belts, gears, or clutches to be lined up.

Engine-generator sets and motors driving draw works, mud pumps, and rotary are all controlled through a central driller's console.

All major components in this new Electro-Motive Power Plant are engineered, manufactured and backed by the world's largest builder of high-horsepower Diesel engines and heavy-duty electric traction equipment. The new plant brings to deep oil well drilling the long-sought advantages of extremely high torque at extremely low speeds. It provides instantaneous control inherent in the Electro-Motive version of Diesel-Electric Drive. And it's offered at a price hitherto untouched by other equipment of this type.

Write us or consult your nearest Electro-Motive Sales and Engineering Representative for further details.

Electro-Motive Division offices located in: New York City, Chicago, Jacksonville, St. Louis, San Francisco and Tulsa.

In Canada: GENERAL MOTORS DIESEL, LTD., *London, Ont.*

Features of Electro-Motive Drilling Rig Power

Completely Integrated Design—Each of the major components designed and built to work together—*one* manufacturer—*one* source of service responsibility.

Maximum Portability—All components on skids, with weight reduced to a minimum. Units are ruggedly designed to withstand moves. No position problem—slashes setup time.

Unmatched Flexibility—Transmission of power is by cables. Slip connections on all cables and controls are so simple anyone can handle them.

Simplified Control—Centralized position for all controls for driller's convenience. Continuously variable draw works speed control without gearshift or reconnection.

Lower Drilling Costs—Lower first cost and lower cost per well drilled. Smooth electric power—plus flexibility of control—speeds drilling, means less down-time.

—Electric Drilling Rig backed by 1 manufacturer

General Motors Diesel-Electric power plant owned by The Offshore Company making hole near Houma, La.

ELECTRO-MOTIVE DIVISION
GENERAL MOTORS

LA GRANGE, ILLINOIS

COMPLETE NATIONAL SERVICE AND PARTS AVAILABILITY

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CHASE® ANTIMONIAL ADMIRALTY HEAT EXCHANGER TUBES

are made to last years longer!

All the hydrostatic tests, corrosion tests, expansion and flattening tests which go on at the Chase mills are designed for one thing—to assure *years* of extra service from Chase Antimonial Admiralty Heat Exchanger Tubes.

But the real test takes place right on the job—where stresses, strains and corrosion are at their very worst. Chase Antimonial Admiralty Heat Exchanger Tubes pass *that* rugged trial with flying colors!

It follows that the longer heat exchanger tube life you get from Chase Antimonial Admiralty *also* means lower operating costs, fewer breakdowns and more time between tube replacements!

Get the benefit of extra years of service—insist on Chase Antimonial Admiralty!

Chase®

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*Handled by Standard Brass & Mfg. Co. **Handled by Vinson Supply Co.

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Atlanta	Cincinnati	Grand Rapids†	Milwaukee	Philadelphia	San Francisco
Baltimore	Cleveland	Houston	Minneapolis	Pittsburgh	Seattle
Boston	Dallas	Indianapolis	Newark	Providence	Waterbury
Charlotte†	Denver	Kansas City, Mo.	New Orleans	Rochester†	(†sales office only)

of Milan, Italy. The thermal-reforming section is already in existence at SAROM'S Ravenna refinery.

The new Iso-Plus Houdriforming installation, with a total capacity of 4,000 bbl. per stream day, is scheduled to go on stream in June 1956.

Fisher to Manage Oilwell's Valleyview, Alta., Store

Appointment of William B. Fisher as store manager of the recently-opened Valleyview, Alta., Canada, store of U. S. Steel's Oil Well Supply Division has been announced by W. A. Weir, Oilwell's Canadian area manager.

Fisher was employed by Oilwell in 1948 as a storeman at Edmonton, Alta. In 1950 he was appointed field representative and transferred to Stettler, Canada. Fisher served as field representative at Swift Current, Sask., Calgary, Alta.; and Dawson Creek, B. C., prior to his present appointment.

Joyner to Manage Pacific Coast Sales for Quaker

The appointment of James H. Joyner as manager, Pacific Coast sales, Quaker Pioneer Rubber Mills, division of H. K. Porter Co., Inc., San Francisco, has been announced by G. A. Dauphinais, vice president and general manager.

Joyner has been associated with Quaker Pioneer as manager, Los Angeles branch, since its acquisition by H. K. Porter Co., Inc., in September 1954. He had previously served Quaker Rubber Corp. as a salesman and manager of Quaker's St. Louis branch. His new duties will include the supervision of Quaker Pioneer's sales personnel and activities in the ten western states.

McGinnis Joins BBD&O

Richard H. McGinnis, formerly with the advertising department, Shell Oil Co., has joined Batten, Barton, Durstine & Osborn, Inc., advertising agency as an account executive on the Ethyl Corp. account.

Welex Transfers Elbert

Ernest M. Elbert has been transferred to the job of sales engineer for the San Angelo district of Welex Jet Services, Inc., the Fort Worth oil-well service company has announced.

Elbert formerly was sales engineer in the Welex Pampa district.

Tired of Juggling Different Kinds of Ball Valves for Corrosion and Abrasion?
Try the New Harbison-Fischer DuMore Balls and Seats
DuMore IS SUPER-HARD Made of a chrome-cobalt-tungsten alloy — the same metal used in machine cutting tools. DuMore is non-magnetic, it won't chip or crack, and wears exceptionally well in sandy fluids.
DuMore IS CORROSION-PROOF
The metallurgical properties are uneffected by sour or sweet oil corrosion, hydrogen sulphide gas, or salt water brine. DuMore will give you long, trouble-free performance under any well condition you may have. Ask your supply store about DuMore. They'll tell you it's the best ball and seat you can run.
COSTS LESS, TOO . . . . . .
DuMore
Balls and Seats
Harbison-Fischer
Manufacturing Company • Fort Worth
"Best Pumps in the Oil Patch"

Finding better solutions to the problems of reservoir evaluation and the refinement of these answers for economically feasible application is an endless process. Constant changes in drilling, completion, and production practices directly influence formation and fluid analysis procedures.

For example, as more wells are completed in very tight zones, the time required to obtain permeability and porosity data and its degree of accuracy have become critically important.

Aided by industry experiments, a Core Lab approach to these reluctant reservoirs is a new type centrifugal extractor designed to rotate up to 6500 RPM, forcing hot solvent to sweep out the residual oil and water content of small typical permeability plug samples. The net result — *more oil extracted in one-half hour than has been heretofore possible in one week by other methods. Greater accuracy and better service at less cost to the client.*

Core Lab's Research and Development Department accepts not only the new and unique problems of reservoir behavior but also maintains a constant program of improving its own standardized techniques and procedures. Combined with a growing back-log of experience contributed by thirty-two permanent area laboratories, this progressive attitude means more reservoir revenue for the industry through better reservoir engineering.

RESEARCH AND DEVELOPMENT DEPARTMENT

CORE LABORATORIES, INC.

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PETROLEUM RESERVOIR ENGINEERING

DALLAS, HOUSTON, CORPUS CHRISTI, MIDLAND, ABILENE, SAN ANTONIO, TYLER, TULSA, FORT WORTH, WICHITA FALLS, SHERMAN, OKLAHOMA CITY, ARDMORE, BARTLESVILLE, PAMPA, ARKANSAS CITY, GREAT BEND, NEW ORLEANS, SHREVEPORT, HATTIESBURG, LAFAYETTE, DENVER, BAKERSFIELD, CASPER, BILLINGS, WORLAND, STERLING, EL DORADO, LUBBOCK, FARMINGTON, LOVINGTON, MONAHANS, SAN ANGELO, CALGARY, EDMONTON, REGINA

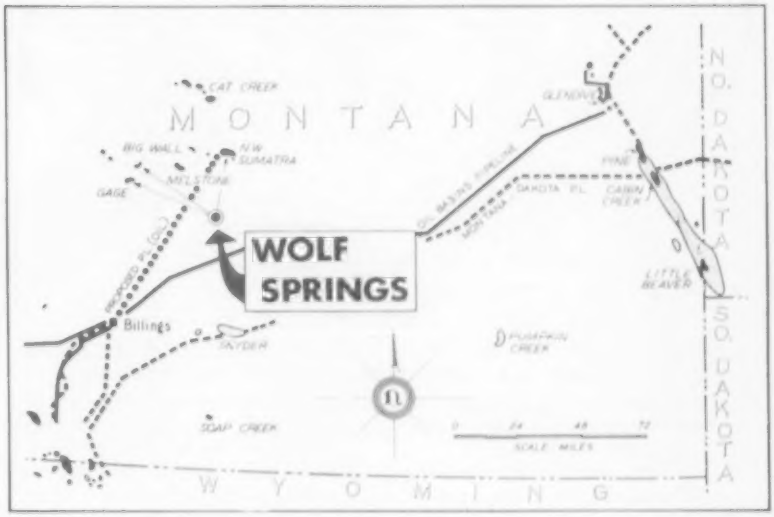
EXPLORATION

"Plucky" Wildcat Scores in Montana

by Frank J. Gardner

ROCKY Mountain oil hunters have not provided the industry with the discovery excitement that was expected for 1955. It's been a fairly quiet discovery year so far, compared with the last four.

But the few really significant strikes that have been made have all carried a flavor of pluck. The wildcats that are drilling in untested, complex areas of dubious promise reflect the geological salesmanship that has taken place throughout the province. Every test, whether successful or not, must invariably fill one more gap in the puzzle of Rocky Mountain geology. And it is the solving of that puzzle that will lead to new oil and gas reserves. Indicated success in the Disturbed Belt of northwestern Montana, on the Las Animas arch of southeastern Colorado, and on the east side of Williston basin will all provide impetus for new campaigns in new places. Therein lies their importance.



Amsden discovery at Wolf Springs, Yellowstone County, Montana, extends production from that formation 24 miles southward.

A commercial success . . . Another one of these "plucky wildcats" now drilling is Atlantic Refining Co.'s 1 Horton estate at Wolf Springs in Yellowstone County, Montana (Section 18-7n-32e). It has already indicated good commercial success in the lower Pennsylvanian, but is probing deeper into the Paleozoics of South Central Montana in a search of possible new Mississippian pays. At last report, operators had carried the test below 8,000 ft. and were still in the Madison, topped at 6,452 ft.

When the first drill-stem test was run in the Atlantic well, it was widely hailed as the year's most important discovery in the Rocky Mountains. That is debatable, but certainly it is destined to be a **prolific** discovery, if the "unofficial reports" of 720 bbl. per day are any indication. The test was run opposite the Amsden dolomite at 6,110-25 ft. That's one reason the well is important, for only four other Montana fields have ever found Amsden flows. Three of these (Gage, Big Wall, and Northwest Sumatra) are indicated by arrows on the map; the fourth, Soap Creek (75 miles south of Wolf Springs) produced Amsden oil as early as 1921, and from a depth of only 1,650-1,700 ft.

In a new area . . . Another reason for the importance of this discovery lies in its geological implications. The site lies off the south flank of the great Central Montana uplift, or Big Snowy anticlinorium, and on the east flank of the Bull Mountain syncline. The structural picture that induced Atlantic to drill here is yet unknown, but the possibility of a group of stratigraphic oil pools along the southern flank of the uplift is enhanced by the success at Wolf Springs. This flank is gently dipping, as contrasted to the steep dips on the north, and the Amsden possibilities between Wolf Springs and Northwest Sumatra will not go untested.

Other and more mundane reasons for the importance attached to Atlantic's Wolf Springs discovery include the proposed pipeline to be built by A. W. Hartwig of Billings to connect Northwest Sumatra to the Billings area. This is to be a 6-in. oil line with a 15,000-bbl. per day capacity, and the tentative routing is not too far away from the new strike. Also, this will be the first flush oil production for Yellowstone County; black oil has been produced intermittently from Mosser dome (26-3s-24e) in the southwestern part of the county, since 1936.

Will encourage a search . . . Lease ownership surrounding Wolf Springs field is sufficiently diverse to indicate a rapid development program after the discovery well is completed. The occurrence of Amsden oil pools at reasonable drilling depths will encourage an active search by smaller companies and independents.

Operators are expected to carry the wildcat at least through the Mission Canyon-lower Mississippian section for complete testing. Original contract called for a 7,500-ft. hole, but at present depth below 8,000 ft., no Mission Canyon top had been released. Carter Oil Co. 1 Yellowstone, an old failure 5 miles southeast of the new well (Section 2-6n-32e) drilled to 8,617 ft. and topped Mission Canyon at 6,913 ft., Lodgepole at 7,420, Devonian at 7,895, Ordovician at 8,250, and stopped in Cambrian topped at 8,450 ft. It topped Amsden at 6,120 ft., compared to 6,108 in the Atlantic discovery.

June . . . Midstream 1955

California—Discovery of the Year

1. Deeper drilling around old known structures gave the Golden State's San Joaquin Valley another deep discovery . . . one of the most significant strikes in recent years.
2. Fresno County's Guijarral Hills field tapped an 8,400-ft. lower Miocene pay.
3. New deep wildcat got under way 1½ miles northwest of production in the Fillmore area of Santa Clara Valley . . . the fourth outpost to seek production at depths below 14,000 ft.
4. New gas-seeking wildcats were planned for three Sacramento Valley counties . . . Glenn, Butte, and Stanislaus.

Rocky Mountains—Exploration Off the Beaten Path

5. Montana wildcat captured the year's first important discovery prize.
6. New-pay discovery indicated for Williston basin's west side.
7. Wildcatters return to the Chadron arch . . . Shell conducting series of tests in Sheridan County, Nebraska; Continental to drill in Sioux, Herndon in Cherry, and McRae in Dawes County.
8. Weld County strike gave Denver-Julesburg basin its second Permian-Lyons area.
9. Gas production indicated on Las Animas arch.

Forward Look for Panhandle Exploration

10. Flurry of wildcats slated for and drilling in far northwestern Texas Panhandle's Dalhart basin, extreme northeastern New Mexico, and southeastern Colorado . . . all of them far removed from production.
11. Oswego-Des Moines production comes to Hansford County.

June in Texas—Devonian, Ellenburger, and Frio Exploration

12. New Devonian structure found in Terry County . . . Second well in York-Ellenburger field southeast of Penwell in Ector County developed good oil shows in the Devonian.
13. Ellenburger production extended 1½ miles north of We-Mac field in Andrews County.
14. Kleberg wildcat — one of the best discoveries of 1955 for the lower coastal region.

Revival in New Brunswick—Record Gas Well in Pennsylvania

15. One of the biggest gas wells ever brought in east of the Mississippi River was potentialed for 149 million cubic feet per day. The big gasser is 12 miles north of Renova on the Potter-Clinton county, Pennsylvania, line in new Greenlick field, opened last January with Oriskany sand production.
16. The search for oil in New Brunswick, one of Canada's Maritime provinces, was revived by an Oklahoma independent operator.

Louisiana Gulf Coast—More Offshore Discoveries

17. Continental Shelf exploration gaining momentum.

Williston — New Interest on East Side

18. Easternmost U. S. Williston strike.

The Old and the New Vie for Interest

by John C. McCaslin

DRILLING in and around old known structures plus isolated wildcatting featured June exploratory activity.

The old . . . Deep and marginal drilling in the San Joaquin Valley and in Canada's New Brunswick Province in the Maritimes headed the success list of old-area developments.

. . . Strand. Shell Oil Co. gave California a first-class oil discovery for the year at a deep test in the central San Joaquin Valley region.

Shell's 1 Pesuncula on the north side of Strand field, 12 miles west of Bakers-

NO. 2
OF A SERIES

Point the way by GRAVITY!

The GRAVITY Method of Petroleum Prospecting is better adapted for regional geologic studies than any other geophysical technique, for it not only provides useful information in areas where other geophysical methods cannot effectively operate, but is the most economical means of pointing out areas of interest for further exploration.

Faults, anticlines, reefs and other known petroleum traps are accompanied by lateral changes in rock densities. These changes in turn produce local variations in the force of gravity which are measurable by the gravimeter. Accurate gravity surveys, properly interpreted, can suggest the possible locations of petroleum traps and thus provide a foundation for efficient seismic surveys.

SSC offers GRAVITY SURVEYS to its clients as a part of a complete exploration service. Its Gravity Division, using effective instrumentation, is staffed with competent and experienced personnel, and is supervised to the end that:

Field Operations must be conducted to SSC's high standards, and—
data is prepared by sound analytical methods*, and interpreted by techniques based on the logical correlation of gravity data with geology.

*SSC's electronic computing facilities are used for gravity analysis.

SEISMIC SURVEYS — GRAVITY SURVEYS — PILOT CREWS — LORAC — VELOCITY LOGGING

Seismograph Service Corporation

TULSA, OKLAHOMA, U.S.A.

WORLD-WIDE EXPERIENCE

Total June Completions, Exploration and Development

	Total completions					Total wildcat wells					Active operations
	Total	Oil	Gas	Dry	Footage	Total	Oil	Gas	Dry	Footage	
Alabama	1	0	0	1	3,520	1	0	0	1	3,520	2
Arkansas	59	34	2	23	199,188	14	0	2	12	56,147	32
California	226	160	8	58	1,091,836	46	5	2	39	238,971	219
Colorado	120	39	5	76	637,150	66	3	3	60	344,693	98
Florida	2	0	0	2	8,079	2	0	0	2	8,079	7
Illinois	395	218	0	177	957,908	56	6	0	50	117,498	528
Indiana	72	24	3	45	103,135	18	1	0	17	23,161	60
Kansas	481	218	42	221	1,700,893	106	15	1	90	433,610	421
Kentucky	132	52	16	64	213,032	35	8	0	27	48,170	158
Louisiana	311	200	25	86	1,885,231	50	13	1	36	468,566	355
North	179	123	14	42	586,342	17	2	0	15	92,810	66
South	132	77	11	44	1,299,189	33	11	1	21	375,756	289
Michigan	52	16	1	35	169,568	22	0	0	22	77,118	121
Mississippi	38	12	0	26	247,948	17	4	0	13	107,537	42
Montana	20	14	0	6	98,390	8	2	0	6	43,275	63
Nebraska	62	20	0	42	353,842	29	2	0	27	162,674	82
New Mexico	167	95	50	22	681,225	17	2	2	13	100,166	144
Northwest	52	0	46	6	173,081	7	0	2	5	15,369	43
Southeast	115	95	4	16	508,144	10	2	0	8	84,797	101
New York	30	15	0	15	57,100	0	0	0	0	0	17
North Dakota	16	10	0	6	123,813	6	1	0	5	37,446	31
Ohio	83	50	13	20	172,793	3	0	2	1	10,483	199
Oklahoma	770	499	26	245	2,577,689	79	13	2	64	338,466	1,178
Pennsylvania	56	14	21	21	153,471	4	0	0	4	31,502	61
South Dakota	1	0	0	1	3,640	1	0	0	1	3,640	3
Texas	1,836	1,079	52	705	7,633,760	485	76	10	399	2,334,628	1,450
North Central (7-B & 9)	765	420	4	341	2,296,522	201	40	3	158	774,283	415
West (7-C & 8)	469	345	2	122	2,509,850	99	15	0	84	563,994	468
Panhandle (10)	70	57	6	7	247,691	4	1	1	2	24,176	60
East (5 & 6)	96	41	12	43	477,643	37	4	1	32	184,014	95
Gulf Coast (2 & 3)	189	82	20	87	1,183,806	60	6	3	51	446,178	200
Southwest (1 & 4)	247	134	8	105	918,248	84	10	2	72	341,983	212
Utah	9	2	0	7	39,448	7	1	0	6	26,785	26
West Virginia	52	2	41	9	135,740	2	0	2	0	9,946	196
Wyoming	46	25	1	20	238,594	15	3	0	12	65,349	160
Miscellaneous	¶1	0	0	1	8,300	0	0	0	0	0	§7
Total June 1955	5,038	†2,798	306	*1,934	19,495,293	1,089	‡155	27	907	5,091,430	5,660
Total May 1955	4,613	2,594	305	1,714	18,476,865	935	134	32	769	4,727,509	5,016
First 6 months 1955	27,696	15,743	1,643	10,310	110,208,318	5,840	883	177	4,780	28,184,040	
First 6 months 1954	25,904	14,582	1,850	9,472	106,799,000	5,251	761	179	4,311	25,854,000	
Western Canada	266	180	10	76	1,090,129	69	8	7	54	311,063	
Alberta	130	93	8	29	663,781	29	5	5	19	149,848	
Saskatchewan	95	59	1	35	309,917	30	3	1	26	115,108	
Manitoba	37	28	0	9	89,030	6	0	0	6	18,706	
B.C.-N.W.T.	4	0	1	3	27,401	4	0	1	3	27,401	
First 6 months 1955	1,'49	801	52	296	5,032,218	326	60	32	234	1,679,269	

*Incl. 44 service wells: Calif. 2, S. La. 1, N. Y. 12, Okla. 22, Pa. 7. †Incl. 50 cond. wells: N. La. 5, S. La. 13, Okla. 5, W. Tex. 1, Tex. Panhandle 5, E. Tex. 2, Gulf Coast 5, S.W. Tex. 14. ‡Incl. 5 cond. discoveries: E. Tex. 1, S.W. Tex. 4. §Incl. Idaho 3, Nev. 4. ¶Nev. 1 field well.

field, is possibly one of the best hits for the area in recent years. On a 12-hour test the well rated an initial production of 1,810 bbl. of 33.5°-gravity oil per day. Flow was on a 28/64-in. choke. The new-pay hit is producing from an upper Vedder sand of lower Miocene age at a depth of 12,360-12,410 ft. The closest Vedder oil is in Greeley field, 5 miles to the north. These upper Vedder sands are prolific both at Greeley and Rio Bravo fields. Based on earlier drilling in the area, it appears that the best prospects for extending the new producing trend will be to the northwest.

... Cod-country oil. An Oklahoma independent operator, O. H. Parker of Ponca City, revived the oil hunt in the Canadian Maritimes.

The operator drilled his first well on a new lease agreement area that covers 10,000 sq. miles of New Brunswick. The well was put down between two marginal oil wells in Albert County's antiquated Stony Creek field in the eastern part of the province. The well made an indicated potential of 100 bbl. per day plus from the Albert-Mississippian sand at 2,900 ft. This field was opened way back in 1909.

The new ... The "new" side of June's exploration picture reveals a shift of interest to far-removed wildcat areas of the country. New discoveries and new wildcat programs were reported from the Central Montana Plains to the gulf waters off South Louisiana.

... Montana. The most significant discovery this year for the Rocky Mountain province gave Yellowstone County, Montana, its first producing prospect.

Atlantic Refining Co.'s 1 Horton estate, 15 miles southwest of Melstone and 24 miles south of Northwest Sumatra field, recovered 6,100 ft. of foamy oil on a drill-stem test in the Amsden dolomitie at 6,108-25 ft. Northwest Sumatra field, nearest Amsden production, is one of the three on the Montana Plains where Amsden produces. The Northwest Sumatra area has been one of the Rockies' most active development areas for the past 2 years.

... Williston basin. Shell Oil Co. uncovered a possible new-pay horizon for the Williston basin's Cedar Creek anticline area in eastern Montana. The 22-X-36 State in Fallon County recovered 3,215 ft. of mud-cut oil on a test of the lower Mississippian at 7,917-62 ft. There is no such production in the basin except for a stray sand in Sanish field, North Dakota. The Shell prospect is 9 miles southeast of Cabin Creek inside Cedar Creek gas field.

Lion Oil Co. moved Williston basin (United States side) production to its easternmost limit at a Bottineau County, North Dakota, wildcat. The 1 Skarphol recovered 2,190 ft. of oil on a

Total Depth Classifications, June 1955

	A 0-1,250 ft.	B 1,250-2,500 ft.	C 2,500-3,750 ft.	D 3,750-5,000 ft.	E 5,000-7,500 ft.	F 7,500-10,000 ft.	G 10,000-12,500 ft.	H 12,500-15,000 ft.	I Over 15,000 ft.
Alabama	0	0	1	0	0	0	0	0	0
Arkansas	2	18	23	9	6	1	0	0	0
California	23	29	25	58	46	28	11	5	1
Colorado	2	0	1	39	75	3	0	0	0
Florida	0	0	0	2	0	0	0	0	0
Illinois	37	154	204	0	0	0	0	0	0
Indiana	36	27	9	0	0	0	0	0	0
Kansas	3	41	262	159	16	0	0	0	0
Kentucky	61	47	22	2	0	0	0	0	0
Louisiana	4	109	18	21	39	45	50	20	5
North	4	108	15	19	22	7	4	0	0
South	0	1	3	2	17	38	46	20	5
Michigan	1	18	11	16	6	0	0	0	0
Mississippi	0	1	2	3	25	3	4	0	0
Montana	0	6	0	5	4	5	0	0	0
Nebraska	0	1	2	6	53	0	0	0	0
New Mexico	3	27	72	30	22	1	8	4	0
Northwest	1	23	11	2	15	0	0	0	0
Southeast	2	4	61	28	7	1	8	4	0
New York	0	30	0	0	0	0	0	0	0
North Dakota	0	0	3	0	1	11	1	0	0
Ohio	37	25	21	0	0	0	0	0	0
Oklahoma	55	247	266	82	60	44	11	5	0
Pennsylvania	0	43	9	0	1	3	0	0	0
South Dakota	0	0	1	0	0	0	0	0	0
Texas	189	420	359	286	365	153	44	20	0
North Central	131	284	112	119	107	11	1	0	0
West	8	37	132	80	121	46	27	18	0
Panhandle	0	2	57	3	7	1	0	0	0
East	4	18	11	24	28	10	0	1	0
Gulf Coast	6	12	14	29	56	58	13	1	0
Southwest	40	67	33	31	46	27	3	0	0
Utah	2	1	1	1	3	0	1	0	0
West Virginia	1	28	17	5	1	0	0	0	0
Wyoming	3	2	8	6	20	7	0	0	0
Miscellaneous	0	0	0	0	0	1	0	0	0
Total June 1955	459	1,274	1,337	730	743	305	130	54	6
Total May 1955	413	1,192	1,078	672	726	327	147	47	11
First 6 months 1955	2,417	6,820	7,027	4,096	4,220	1,933	810	323	50
Western Canada	0	72	57	47	76	13	1	0	0
Alberta	0	12	12	24	70	11	1	0	0
Saskatchewan	0	34	33	23	4	1	0	0	0
Manitoba	0	26	11	0	0	0	0	0	0
B.C.-N.W.T.	0	0	1	0	0	2	1	0	0
First 6 months 1955	6	211	280	214	354	62	20	2	0

drill-stem test in the Mission Canyon. The well is just south of the Canadian border, and 7 miles east of Northeast Landa field.

. . . **Las Animas arch.** Pennsylvanian gas production was indicated at a southeastern Colorado wildcat, 10 miles northeast of Las Animas. Stansbury 1 Coordes & Oberlander in Bent County recovered 2,000 M.c.f. of gas per day on test of either the Atoka or basal Des Moines. Successful completion would give the arch its first production.

. . . **West Texas.** The Texas Co. 1 Spradling, a deep wildcat 10 miles southwest of Brownfield in Terry County, indicated another Devonian structure for the area. The new pool is 5 miles north of Northwest Wellman field, a Devonian or Siluro-Devonian producer.

. . . **Lower Gulf Coast.** Arkansas Fuel Oil Corp. made what appears to be one of the best oil strikes in Texas' lower coastal region this year at the 1 May in southern Kleberg County. The well flowed at the rate of 10 bbl. of oil per hour from a Frio sand at 9,350-62 ft. It is 4 miles north of Riviera Beach field, nearest production in that sparsely drilled section of the lower coastal region.

. . . **Offshore.** Magnolia Petroleum Co. opened two new fields in as many weeks off the coast of Louisiana. One new discovery was made in Block 128, Eugene Island area, 30 miles off St. Mary Parish. The second well hit 45 miles southeast in Block 113, Ship Shoal area, 20 miles off Terrebonne Parish.

EXPLORATION HIGHLIGHTS

MID-CONTINENT

KANSAS

Harper Wildcat Shows For Mississippi Strike

Harper County has a Mississippian discovery in the mill. It is Rupp-Ferguson Oil Co.'s 1 Kennedy in NW NW SW 15-31s-9w.

A drill-stem test at 4,406-31 ft. made 1,300 M.c.f. of gas and 205 ft. clean oil. This promising discovery well is 1½ miles west of Grabs field production.

Pump Going Up at New Stafford Producer

Stafford County has a new pool at Petroleum Management 1 Ward, SW SW NE 11-23s-11w. The operator is installing pump after a swab test recovered 6½ bbl. of oil hourly for 11 hours. The pool-opener is located 1½ miles northeast of Happy Valley pool production.

OKLAHOMA

Rework Well in Lincoln Opens Prue Gas Pool

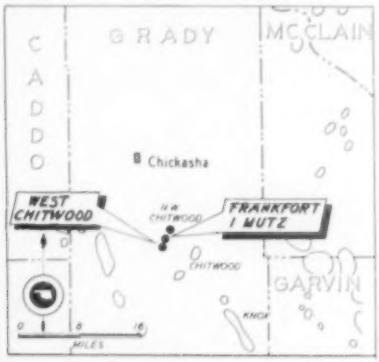
An old wildcat worked over has opened a new Prue sand gas pool in Lincoln County's 18-15n-3e area, west of Southwest Mount Vernon field. The discovery well is Davidor & Davidor 1 Mason in the SW SW NW of 18. The well is flowing 5,540 M.c.f. of gas per day from perforations in the sand at 3,945-55 ft. The same operator is at work on another workover well, the 2 Mason in SW NW NW 18.

Fault Zone Appears Evident Near West Chitwood

Production tests are due at Frankfort Oil Co.'s important Deese sand discovery near West Chitwood field in Grady County. The 1 Mutz, SE NW NW NW 24-5n-7w, recovered 6,369 ft. of oil on a drill-stem test at 9,827-59 ft. Recovery on a deeper test at 9,951-10,001 ft. was 7,359 ft. of 40°-gravity oil. The 6,369 ft. of oil was in the Hoxbar sand.

The 1 Mutz is 1 mile northeast of production at West Chitwood field. It appears that a fault zone exists between the two areas. This may be a key to the possible fault zone suspected to lie on the west side of Chitwood field to the east.

Magnolia Petroleum Co. recently completed a new pay discovery at Northwest Chitwood field. The 1



A new producing area has been established by Frankfort Oil Co. at 1 Mutz, between West and Northwest Chitwood fields in Grady County. Production is from Deese and Hoxbar sands. Northwest Chitwood field has Deese and Haxbor sand production. Production at Chitwood is from Springer sands. West Chitwood field has Deese oil.

Bowen, NE NW 19-5n-6w, pumped 142 bbl. of 36°-gravity oil per day from the Hoxbar at 9,658-80 ft. Previous production in the field was from the Deese sand below 9,800 ft.

Operator Drilling Ahead At Stephens Prospect

Schafer Drilling Co. is going on down toward 6,000 ft., objective, at the 1 Smith in C SW SW 5-1n-8w, indicated discovery in Stephens County, southern Oklahoma.

The well flowed oil at the estimated rate of 10 bbl. per hour on test at 3,578-86 ft. Another test at 3,590 to 3,625 ft. flowed oil at the rate of 60 bbl. in 2 hours.

Extension Indicated at Kay County's East Blackwell Pool

The East Blackwell area in Kay County, northern Oklahoma, is in for an extension discovery. The prospective strike is T. Blake Dirickson's 1 Heide, NW NE NE 21-27n-1e.

The well flowed Wilcox sand oil at an unestimated rate on test at 3,832-45 ft. The operator is making production tests of an open hole interval with casing landed at 3,833 ft.

Northeast Bradley Bromide Pay Extended to the West

First Bromide sand production in Grady County's Northeast Bradley area

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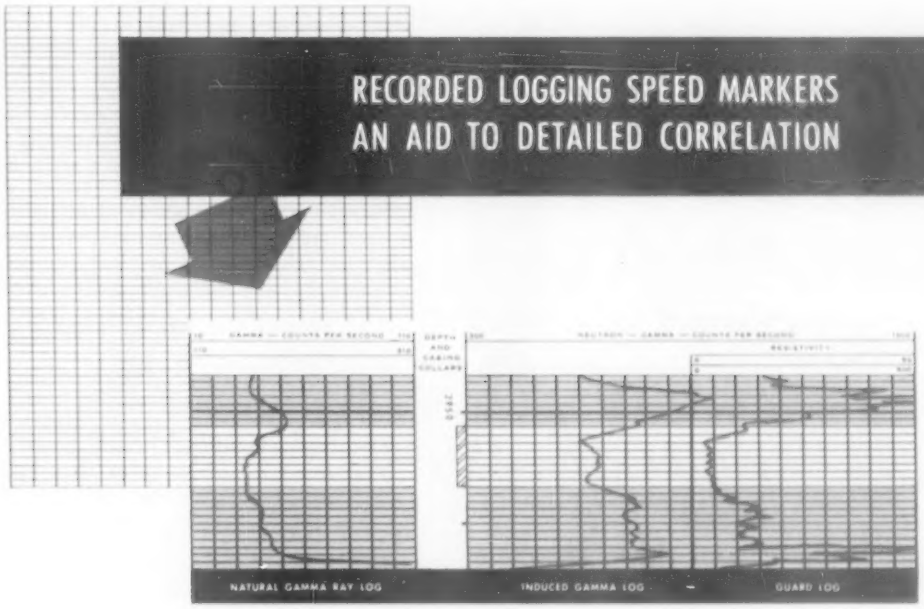

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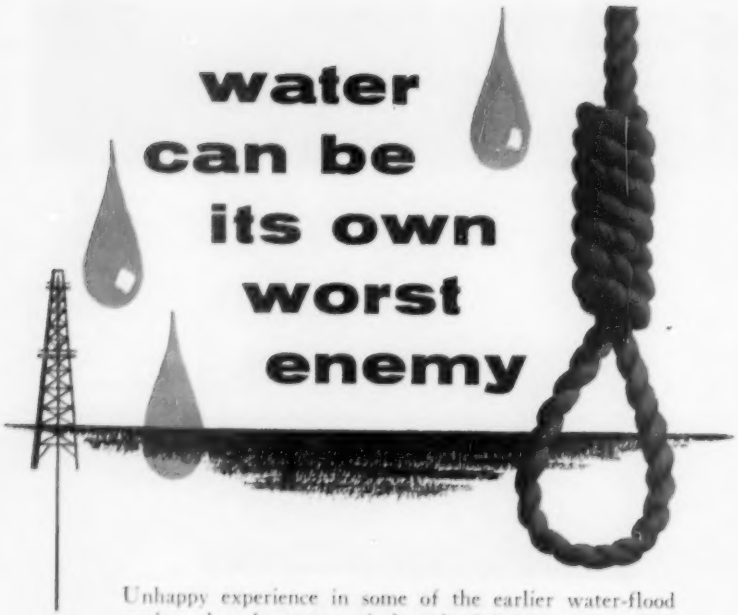

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has been extended to the west at 1 Mackey, C NW NE 11-5n-5w. The Superior Oil Co. well flowed oil at the rate of 73 bbl. hourly on a deep drill-stem test at 13,165-13,225 ft. Another test at 13,225-65 ft. flowed oil at 43 bbl. per hour. Recovery on a test at 13,265-13,314 ft. was 1,320 ft. of oil, 80 ft. heavily gas-cut mud and 350 ft. salt water. Coring continues on down.

NORTH TEXAS

Foard County Wildcat Gage Corrected

Foard County's second recent discovery has been completed for a flowing potential of 143 bbl. of oil a day, through 9/64-in. choke, from the Caddo conglomerate at 5,410-18 ft. Flowing tubing pressure was 380 psi. Pay section was reported from 5,410 ft. to 5,500 ft., total depth.

HUGOTON EMBAYMENT

SOUTHWEST KANSAS

Mississippian Discovery in Meade County Completed

A Chester discovery in southwestern Kansas' Meade County has reported its final gage. The strike is Carter Oil Co. 1 Adams ranch in SW NE 1-35s-29w.

The well flowed 7,390 M.c.f. of gas per day on a ½-in. choke from perforations at 6,076-6,106 ft. in the Chester-Mississippian lime. Acid was used. The well was finaled on a calculated open flow of 21,090 M.c.f. per day. The new field is located 4½ miles east of nearest production . . . East Adams Ranch-Morrow field. This new discovery is expected to revive wildcatting in Meade County.

OKLAHOMA PANHANDLE

Sun Completes Tests At Harper Discovery

One of the most significant discoveries in Northwest Oklahoma in some time has finished up production tests. Sun Oil Co.'s 1 Holmes, SE NE 30-26n-24w, Harper County, flowed an estimated 20,000 M.c.f. of gas per day and is now shut in. The well previously flowed 23 bbl. of distillate in 14 hours on a ¼-in. choke. The producing sand is the Morrow. Perforations are at 7,013-50 ft.

This northwestern Oklahoma discovery, reviving exploration in a long-inactive area, is located 4 miles east of the town of Laverne, Okla. It is 3½ miles southwest of Southwest Stockholm field; 4 miles northeast of South

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Laverne field, both inactive 1952 discoveries.

Camrick Field Moves Into Beaver County

The Oklahoma Panhandle's Camrick area has pushed across the Texas County line into Beaver County at Carter Oil Co. 1 Manning, NW NW SE 19-1n-20eCM. The well brings first oil to the Beaver County side of the field.

Oil production in the Camrick field area has moved across the county line into Beaver County at Carter 1 Manning.

The discovery well, 2 miles east of gas and oil production at Camrick, is a Morrow prospect at 7,111-23 ft. Swabbing got 20 bbl. of new oil in 6 hours. Carter is conducting tests.

Toronto Is New Pay for Beaver's Mocane Field

Beaver County's prolific Mocane area has another new-pay discovery. This time it is the Virgil-Toronto Pennsylvanian sand. The discovery well belongs to Carter Oil Co. Their 1 Baldwin-Evans, NE NE SW 7-5n-25eCM, 1 mile west of production in Mocane field, gaged 1,890 M.c.f. of gas daily from perforations at 4,615-35 ft. in the Toronto. Calculated open flow was 2,320 M.c.f. The closest such production is at Northwest Mocane field, 1½ miles northwest.

The well is a dual producer. It made 24,000 M.c.f. of gas per day or calculated flow of 25,000 M.c.f. per day from perforations in two parts of the Morrow sand at 6,214-22 and 6,229-42 ft.

Extension at Southeast Mocane . . . The Texas Co. has extended this Beaver County field 2 miles to the north at 1 Barby "F," NW SE 22-5n-25eCM.

The well flowed 1,760 M.c.f. of gas per day from Morrow sand at 6,760-6,800 ft. Gas also flowed from the Mississippian-Chester lime at 6,971-7,002 ft.

TEXAS PANHANDLE

Missouri Gas-Distillate Strike for Hansford Area

North-central Hansford County has a new Missouri lime gas-distillate discovery area. The discovery well is Sharples Oil Corp.-Baker-Taylor Drilling Co. 1 Betty, Section 24, Block 1, Cherokee Iron & Furnace Co. Survey.

The well flowed 9,500 M.c.f. of gas per day and 9 bbl. of distillate per million after treatment. Perforations were at 5,870-90 ft.

North Hansford . . . First Douglas-Virgil production for this Hansford County producing area is in prospect at Cities Service Oil Co. et al 1 Vernon "A."

The well flowed 1,250 M.c.f. gas per day by the end of a drill-stem test at 4,832-80 ft. in the upper Douglas sand. The well is in Section 7, Block 2 SA&MG Survey, 11 miles northwest of the town of Hansford. It is 1 mile north of nearest Tonkawa gas wells in the field proper.

SOUTHEAST COLORADO

Important Wildcat Tests Gas in Marmaton Lime

One of the most potentially important wildcats drilling in the Hugoton embayment is Superior Oil Co.'s 44-6 Stafford, SE SE NW 6-35s-41w, Baca County.

The well flowed 481 M.c.f. of gas per day from the Marmaton-Des Moines at 3,689-3,720 ft. The operator will make more perforations for further testing.

This significant well is located 20 miles southeast of Stonington, 5 miles southwest of Morton County, Kansas', Interstate - Morrow oil field. It is 8 miles northwest of Morrow gas production in Oklahoma's Keyes area, Cimarron County. Successful completion of the wildcat could mean a link-up between the prolific Pennsylvanian pools at Greenwood, Kans., and Keyes, Okla.

WEST TEXAS-NEW MEXICO

WEST TEXAS

King Mountain Extension Flows Ellenburger Oil

The new King Mountain-Ellenburger field of southwestern Upton County had prospects of a northwest extension at Hunt Oil Co. and others' 1 Rosa Halff Barnett. Initial drill-stem test at 11,710-11,845 ft. flowed oil at the rate of 30 bbl. an hour.

Sample-top on the Ellenburger was 11,730 ft., or minus 8,646 ft. This was reported to be around 188 ft. low to the discovery well, but operators said the top of porosity was approximately the same in both wells.

Terry County . . . The Texas Co. 1 Spradling, wildcat 4 miles south of Gomez, west-central Terry County, was still trying to make a well. Operators were installing pumping equipment, and expected the well would produce around 60 bbl. of oil a day. It was also making considerable water.

Earlier tests produced a flow up to 40 bbl. an hour while drill-stem testing the Devonian at 12,670-12,784 ft.

Ector County . . . The second well for the York-Ellenburger field, southeast of Penwell, was assured at Humble Oil & Refining Co. 1-G TXL, ⅜ mile southeast of the discovery.

On a 5-hour test in the Ellenburger at 12,485-12,515 ft., the well unloaded while coming out of the hole. Total oil recovery was not reported. Operators cored ahead.

ARK-LA-TEX

EAST TEXAS

Porosity Reported in Rusk County Wildcat

Texas Eastern Production Corp. 1 Walters, wildcat 5 miles northwest of Tatum in Rusk County, has logged 27 ft. of porosity, at three intervals, in the Pettit limestone.

A test had not been made at this report. Operators ran casing to 6,917 ft. and were checking electrical logs. Location is in the John Walters Survey.

Pettit Strike Is Potentialed

F. R. Jackson and John C. Robbins 1 Louie Bryant, located 1½ miles southwest of the two-well John C. Robbins field, has been completed as a discovery, or long extension.

On 12/64-in. choke, the well flowed oil with no water, at the rate of 176 bbl. a day. Gravity was 41°, and gas-oil ratio was 1,100:1. No. 1 Bryant topped the pay at 7,108 ft., on elevation of 324 ft., and perforated at 7,107-13 ft. Flowing tubing pressure was 600 psi.

Cass County . . . The Lottie Haynes field in southeastern Cass County gained a new producer at W. G. Skelly 1 Baldwin, located in James Taylor Survey, A-1029. On potential test from

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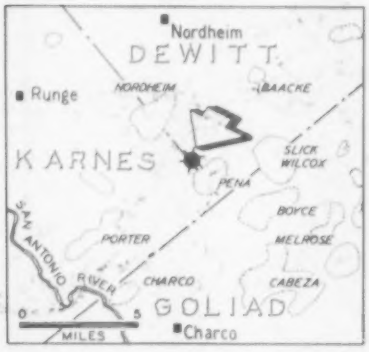
the Mitchell sand at 5,982-98 ft., 24-hour gage was 320 bbl. of 39° oil, through ¼-in. choke. Tubing pressure was 525 psi., with gas-oil ratio of 512:1.

GULF COAST

TEXAS GULF COAST

DeWitt County Discovery Reveals New Wilcox Area

Coastal Trend Oil & Gas Co. has a new gas-condensate discovery well in the south corner of DeWitt County.



Arrow points to location of Coastal Trend Oil & Gas Co.'s new gas-condensate discovery well in south corner of DeWitt County.

It is the company's 2 Pargman, completed with a calculated open-flow potential of 6,000,000 cu. ft. of gas daily. Gas yields 6 bbl. of 62°-gravity condensate per million cubic feet. Production is from a Wilcox sand with perforations at 4,074-76 ft.

Location is 5 miles south of Nordheim, near the Karnes County line. It is 2 miles northwest of the Wilcox-productive Pena field, between that field and Nordheim field, 3 miles to the northwest. The discovery is separated from Pena field by dry holes.

San Patricio Wildcats Make Double Discovery

Two new discovery wells, located ¼ mile apart, are being completed east of East Mathis field, 2 miles north of Edroy, in northwestern San Patricio County.

One is an oil producer, Calvert & Manley 1 Keeton, which flowed at the rate of 172.8 bbl. per day from perforated interval at 5,550-58 ft. Flow was through 5/32-in. choke with pressure of 650 psi. Gravity of the oil is 32.9°. Gas production was in the ratio of 210 cu. ft. per barrel of oil.

It is just west of Pontiac Refining Co.'s new gas-condensate discovery well, 1 Chopelas, completed from per-

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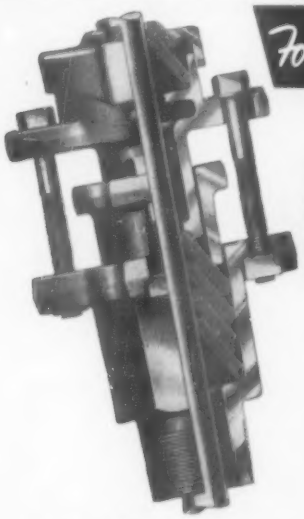

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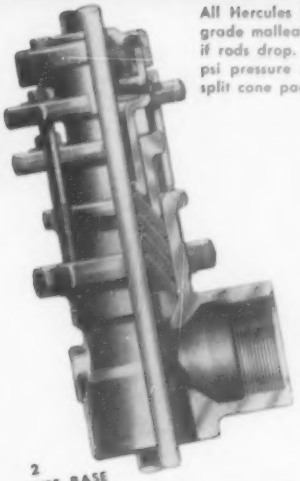
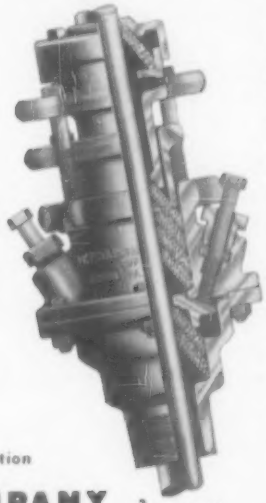


2 "TEE BASE TYPE" DUPLEX POLISHED ROD STUFFING BOX-TEE



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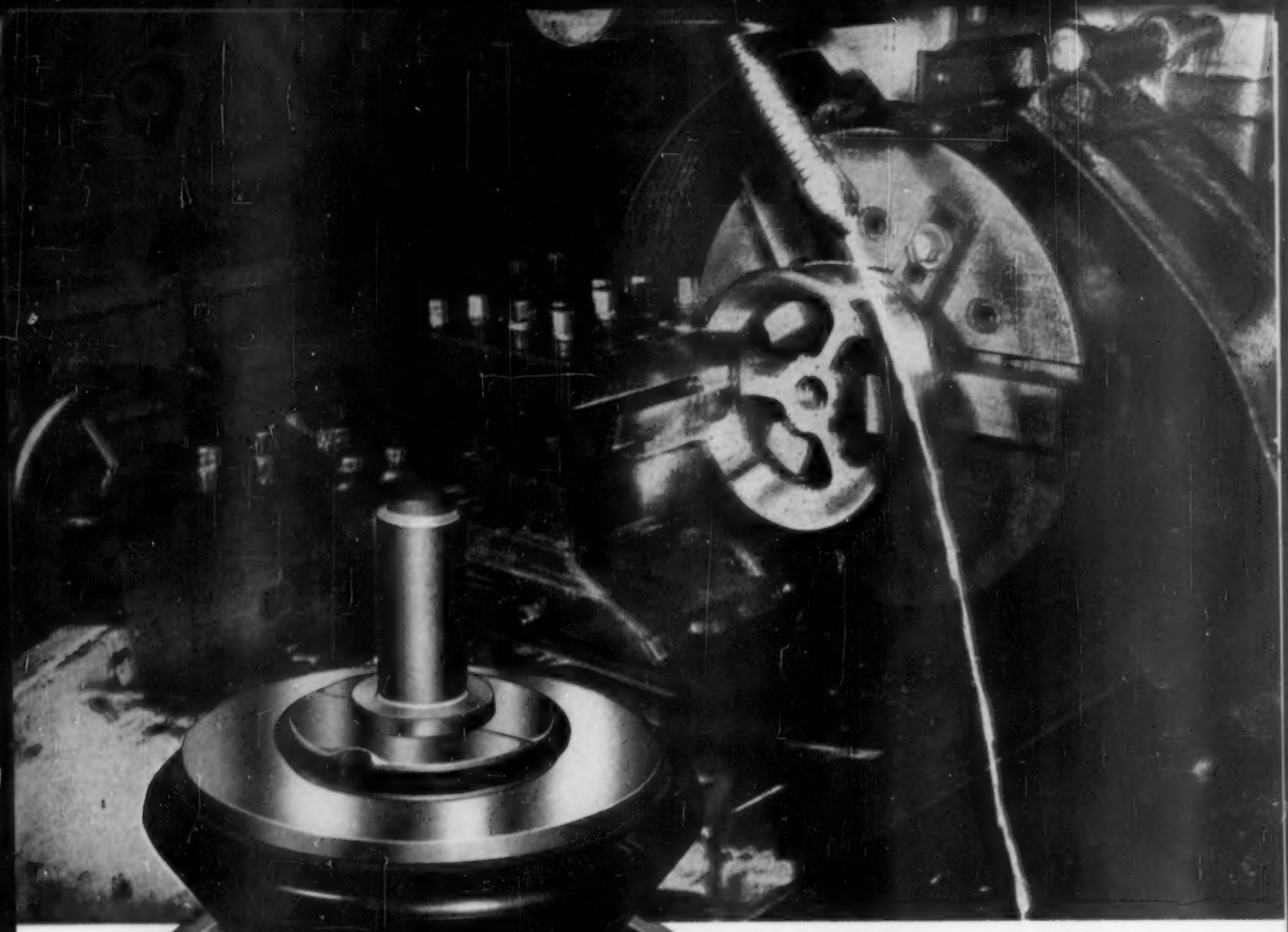

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Portion of northwestern San Patricio County showing location (indicated by arrow) of Calvert & Manley's new oil discovery (left) and Pontiac Refining Co.'s nearby gas-condensate strike.

forated interval at 5,611-16 ft. This well is rated good for 17,000,000 cu. ft. of gas per day, open-flow potential, with liquid recovery of 1 bbl. to 116,000 cu. ft. of gas. Flowing pressure through ¼-in. choke was 2,050 psi. Shut-in pressure is 2,185 psi. Gravity of the liquid is 58.1°.

The Calvert & Manley well, drilled to 5,782 ft., also has the 5,600-ft. gas sand opened by Pontiac Refining Co., and will be completed in it as well as in the shallower oil zone.

Signet Drilling Co. is putting down a 660-ft. north offset to the Calvert & Manley discovery. It is 1,750 ft. west-northwest of the Pontiac gasser.

SOUTHWEST TEXAS

Navarro Play Uncovers Another Atascosa Field

The active Navarro play extending across northwestern Atascosa County into eastern Frio County has uncovered another new producing area.

It has been discovered by Texas Eastern Production Corp. at its 1 Finch, in the John M. Finch Survey, 4 miles west of Charlotte, in western Atascosa County, near the Frio County line.

The new discovery well is rated good for 100 bbl. of oil per day, flowing through ¼-in. choke under pressure of 150 psi. Productive interval (perforations) is 5,020-35 ft.

Drilling is under way at the operator's second test, 2 Finch, a location west of the discovery.

Jim Wells County Gets New Oil-Producing Area

L. M. Lockhart's new discovery well, 1 Galindo, 8 miles northwest of Alice, in northern Jim Wells County, flowed 110 bbl. of 44°-gravity oil per day during its completion gage through 11/64-in. choke. Flow was under pressure of 90 psi. on the tubing with 365 psi. on the casing. Production is from perforated interval at 4,956-60 ft.

Location is 2½ miles west of Rowe field, nearest previous production, and about 2 miles from a new gas-condensate discovery well being completed by H. R. Smith. The latter well, 2 Baker heirs, flowed at the rate of 1,360,000 cu. ft. of gas per day, recovering 2.8 bbl. of condensate per million cubic feet. Its pay is perforated at 3,110-16 ft. Shut-in pressure is 890 psi.

New Oil Area Uncovered In Jim Hogg Discovery

A new oil-productive area has been opened in northern Jim Hogg County. Location is 7½ miles southwest of Hebbronville a short distance southeast of the southeast corner of Duval County. It is northeast of Armstrong field.

Discovery is by Blair-Vreeland and associates at their 2 Strohman. The well flowed 46.16 of 32.7°-gravity oil per day through 7/64-in. choke with pressure of 585 psi. and gas-oil ratio of 714 cu. ft. per barrel.

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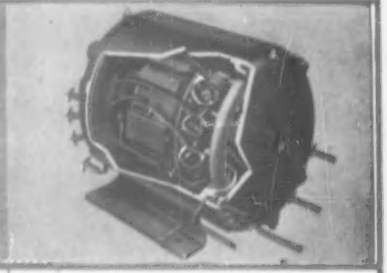

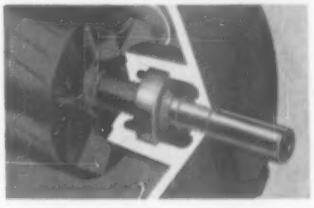

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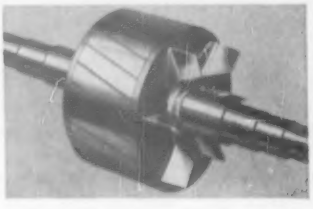

COPPER-CLAD ROTORS . . . Howell motors have copper-clad rotors. This means better heat conductivity, stability at high temperatures and, as opposed to die-cast rotors, greater design flexibility to meet your special requirements. Compare!

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SOUTH LOUISIANA

Deep Sand Test Indicates New Vermilion Bay Field

Monterey Oil Co. and associates are continuing production tests in their new deep, gas-condensate discovery well in southern Vermilion Parish.

The well, located on State Lease 2476, in Vermilion Bay, 4 miles south

Arrow points to location of Monterey Oil Co.'s new gas-condensate discovery well in Vermilion Bay, southern Vermilion Parish.

of the deep Live Oak field, is bottomed at 13,831 ft. and has pipe run to total depth.

First tests, in Miocene sand perforated at 13,782-87 ft., resulted in a flow rate of 19,000,000 cu. ft. of gas and 72 bbl. of condensate per day, gaged through 5/32-in. choke. Flow was under pressure of 3,450 psi. Shut-in pressure was 4,000 psi.

Next tests will be in a higher sand zone, topped at 13,554 ft. and bottomed at 13,648 ft.

Associated with Monterey in the operation are Freeport Sulphur Co. with 37½ per cent interest, and C. G. Glasscock with 25 per cent interest.

Nearest production is in Live Oak field, discovered in February 1954 by Houston Oil Co. That field, with four wells completed so far, produces oil, gas and condensate from a series of sands ranging in depth from 12,000 ft. to below 13,300 ft.

APPALACHIAN

PENNSYLVANIA

In Gaskill Township, Jefferson County, southwest Pennsylvania, Columbian Carbon Co., has started operations in a wildcat test, No. 1830 Harriet C. McClure, elevation 1,700 ft., Punxsutawney Quadrangle, 4.27 miles south of latitude 41 degrees 00 minutes

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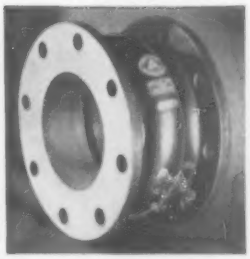
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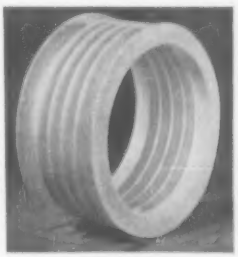
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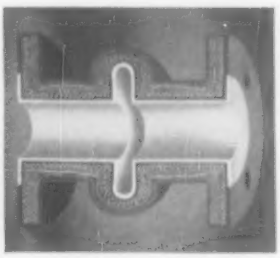
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● Kiskiminetas Township, Armstrong County, Fred M. Schreckengost et al, 1 Wm. Schreckengost, is drilling at 5,002 ft.

WEST VIRGINIA

Banks district, Upshur County, West Virginia, Washington Natural Gas Co., has made a location for 1 John R. Gillispie, wildcat, elevation 2,125 ft. It will be a test on the Hiram anticline and may indicate an extension of the gas pool to the southwest. This well is on the Pickens Quadrangle .25 mile south of latitude 38 degrees 45 minutes and .97 mile west of longitude 80 degrees 10 minutes.

● Grant district, Jackson County, D. D. Foster, has announced 1 Everett Burdette, elevation 834 ft., and B. H. Putnam, his 1 J. L. Snodgrass, elevation 838 ft., and 1 Roy Kirkhart, elevation 872 ft.

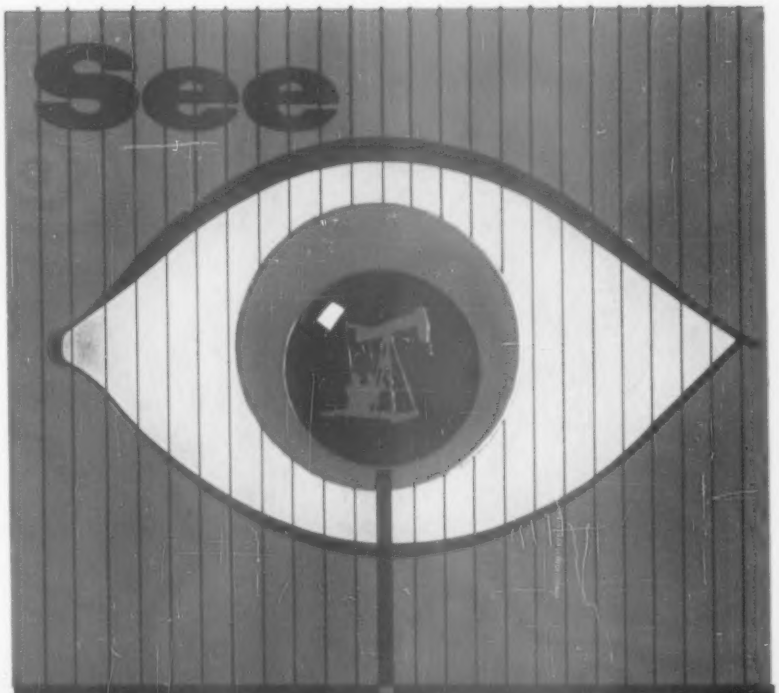
● Licking district, Tucker County, Hope Natural Gas Co. 9940 James E. Watson, elevation 1,809 ft., reached the chert at 4,497 ft., and ran the 7-in. casing at 4,517 ft.

GREAT LAKES

MICHIGAN

First flowing Dundee dolomite oil pay in Lincoln "6" pool, Lincoln Township, Clare County, was ready for test as week closed. This new well the first follow-up to discovery to log oil pay out of 4 tests drilled, is the William B. Stewart and Basin Oil Co. 1 Tolson, SW NW SE 6-18n-5w, the diagonal northeast 10-acre offset to the small discovery producer which is now pumping between 10 and 13 bbl. of oil daily. Operators estimated that this well was good for upwards of 100 bbl. of oil an hour, but it is not expected that any potential, open-flow test will be made. Dundee top was logged at 3,967 ft. and pay was topped at 3,969½ ft., present total depth. Michigan Oil Co. and Bill Whyte are equal interest owners in this new well with Stewart and Basin. Tanks were set and tubing was run under pressure, but no gages had been announced. Well started flowing immediately after tubing was landed.

The Lincoln "6" area has long been viewed by Michigan geologists as a potential Dundee area and a series of test wells have been drilled there. But wells on the top of the feature have in most cases logged a dense lime section in the Dundee. This new producer, like the discovery well, is down on the flank of the structure, but even then the flowing well is about 4 ft.



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higher structurally on Dundee objective than the discovery. There appears to be an area of about 200 to 300 acres in the district which may produce from Dundee. This group of operators control the bulk of this spread. The Lincoln "6" pool is located about 3 miles due east of the Freeman-Redding Dundee oil pool, Clare County.

A Saginaw County wildcat, scheduled to be drilled into Dundee pay early this week, was being closely watched as a show of gas was logged in top of objective before long string 5-in. casing was run. The O. H. O'Neal 1 Baumgartner, NW NW NW 17-11n-3e, Swan Creek Township, was cased with 5-in. at 3,003 ft., Dundee top. Preliminary checks indicated that this wildcat may be about 8 ft. higher structurally on Dundee top than an earlier test, located about ¾ mile northwest which carried a near-commercial oil pay about 87 ft. in the Dundee objective.

The 1 Tolso, SW NW SE 6-18n-5w, Lincoln Township, Clare County, first natural-flowing Dundee oil well in the Lincoln "6" pool, drilled by William B. Stewart and Basin Oil Co., flowed initially after tubing had been run, at a restricted rate of 33 bbl. of oil an hour. Well was pinched back further and was being produced on a more extended test at about 5 to 6 bbl. of oil an hour. Dundee top was logged at 3,965 ft. and well was bottomed out in flowing oil at about 3,972 ft., total depth.

The 1 Tolson is the diagonal northeast 10-acre offset to the small Dundee oil discovery producer in the pool and is the first of four wells drilled since the discovery to be completed successfully. This week same operators had moved drilling machine one 10-acre offset due east of the 1 Tolson to drill next well in the area, in the SE NW SE 6-18n-5w.

● Two deeper horizon test wells were announced for Michigan's shallow southwestern district this week. Both of these tests are located in Salem Township, Allegan County, one on the west side of the old Dorr Traverse pool and the other in the Salem Traverse oil pool. Both will be drilled with cable tools and will penetrate the basal Salina-Niagara. One of the two may be drilled to the Trenton.

Louis Zellman had location staked for the Dorr area test in the NW SE NE 25-4n-13w. This well is located about 2 miles northwest of an older well which logged a black oil pay in lower horizons and was produced for several months. Zellman may drill his test to Trenton.

In the Salem pool, Walter E. Anderson will drill a basal Salina-Niagara test in the SE NE NW 20-4n-13w, just 1½ miles due west of an earlier basal

Youngstown

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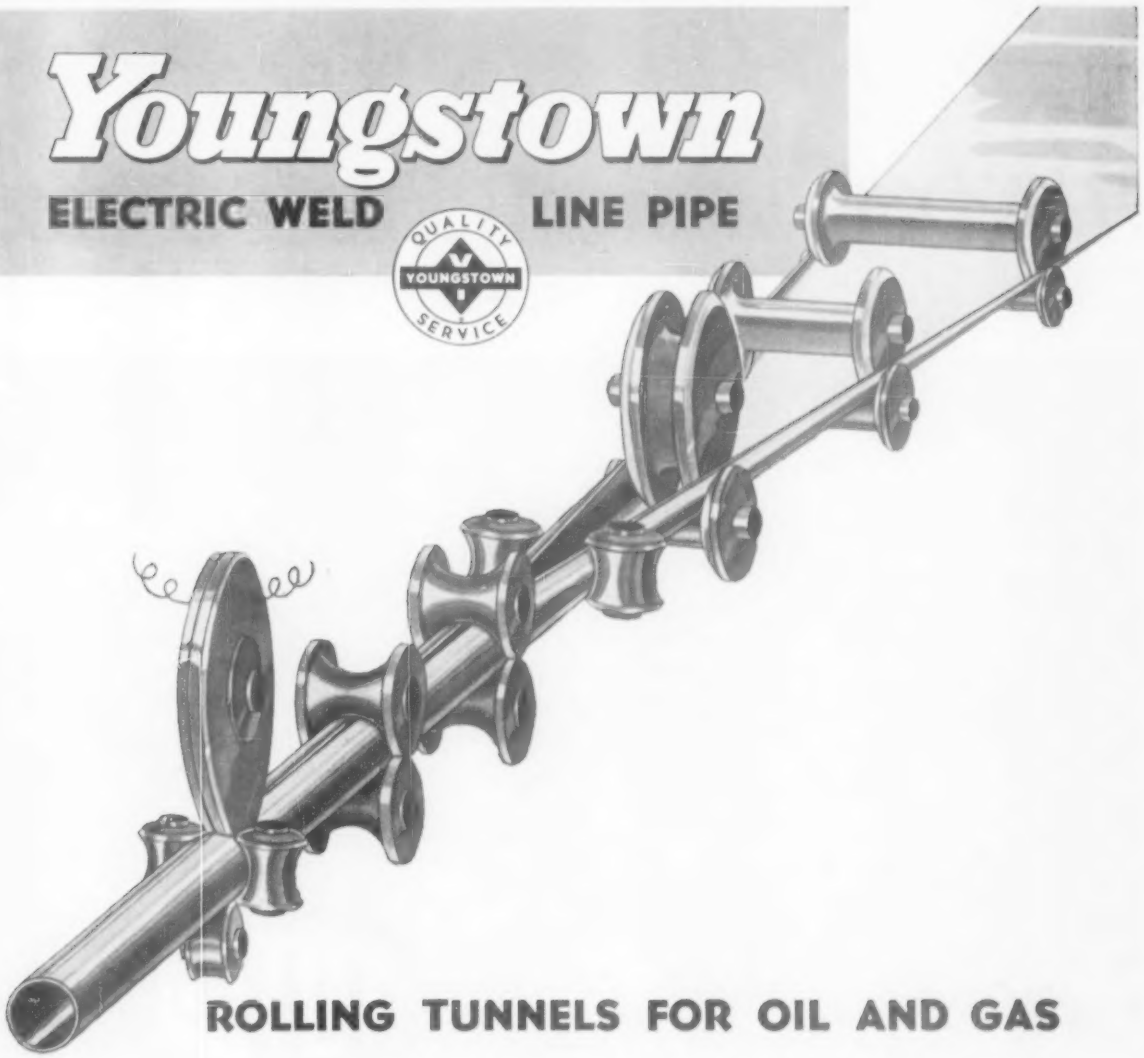

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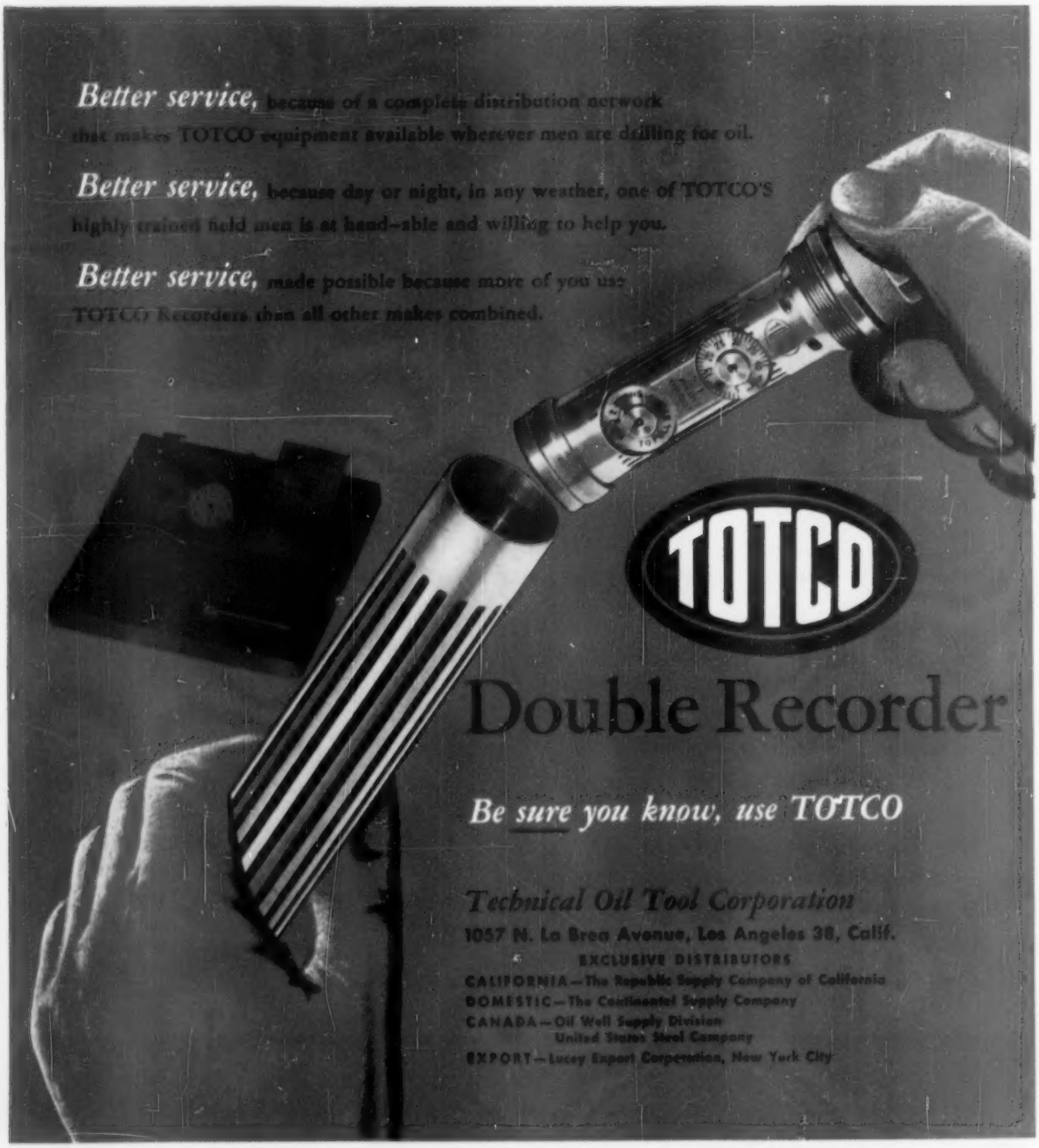
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Salina well which was completed and is being produced as a 300,000 cu. ft. gas well.

EASTERN INTERIOR

ILLINOIS

In Saline County John Buchman and C. E. O'Neal & Co. 1 Wettaw, SW SW NE 20-8s-6e, 5 miles north of Harrisburg, recovered 125 ft. of clean oil, 90 ft. gas-cut muddy oil, on a drill-stem test in the Aux Vases sand at 2,851-59 ft. Casing has been set for tests. This wildcat prospect is 3 miles from production.

● In White County, 2 miles east of Concord in SW NW SW 26-6s-10e, Calvin Oil Co. and T. M. Bane 1 Pomeroy is testing in the Aux Vases. Recovery on a test in the Tar Springs at 2,198-2,218 ft. was 110 ft. of clean oil. A test in the upper Cypress at 2,554-69 ft. got 1,020 ft. of oil. These are both new producing sands for this particular area. The well is four locations away from wells producing from the Aux Vases.

● C. C. Beebe has completed his 1 Ben Miller, SE SE NW 7-3s-14w, 2 miles northwest of Grayville in Edwards County, 1 mile from production. The Rosiclare discovery (3,096-3,104 ft.) finaled for 135 bbl. of oil per day, natural.

PACIFIC COAST

CALIFORNIA

Ventura County Sespe Test Completed

E. L. Doheny and Richfield Oil Corp. jointly have made a discovery in the Montalvo area of Ventura County. With the area complicated geologically by cross faults, the new well may be either an easterly extension of Colonia pool in West Montalvo field to the west, or a fault block accumulation.

The 1 Laubacher, SE SE 5-1n-22s, flowed at the rate of 980 bbl. of 28.1°-gravity oil a day and 427 M.c.f. of gas through a 20/64-in. choke from intervals in the Sespe formation at 11,106-22 ft. and 11,126-34 ft. Location is about 2 miles east of the seacoast.

The well is about 1,200 ft. higher structurally than Standard's 1951 Colonia pool discovery 2½ miles to the northwest and its success gives rise to speculation that the pool may even extend on 2 miles farther east as far as the town of Oxnard. Richfield recently acquired leases totalling about 2,000 acres within the Oxnard city

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Rated load: 120,000 Lbs.
Total weight: 157 Lbs.
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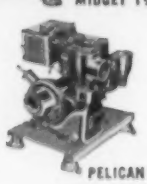
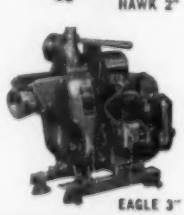


PELICAN 2"

HAWK 2"



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limits. Doheny and Richfield together have about 1,000 acres around the Laubacher well.

Showings in Sunray Mid-Continent Oil Co.'s 1 Sunray-Ohio-Del Cielo in NE 31-2n-22w about 1 mile northwest of the Doheny-Richfield discovery, indicate that this well will also be completed successfully. It is presently drilling below 14,600 ft.

Southeast Cuyama Valley Wildcat

The Cuyama Valley, in which there has been little wildcatting for several years due to many failures, will come back into the news when Shell Oil Co. begins work on a deep test 4 miles southeast of South Cuyama field. Shell has staked a location for 22-23 Heller in NW NW 23-9n-26w. This is about 1¼ miles east of an unsuccessful test drilled to 10,053 ft. by Superior Oil Co. 3 years ago. Honolulu Oil Corp., Oceanic Oil Co., and Texas Co. have also drilled dry holes in the area. Oceanic Oil Co., which leased several thousand acres south and east of the new Shell location in 1950, still holds about 3,600 acres.

Tejon Outpost Has Shows in Jewett

A northwest outpost well has logged 25-30 ft. of Jewett sand in the Tejon area of Kern County. C. F. Wehr 63-20 Butler-Wehr, SW NE 20-11n-19w, obtained shows at approximately 9,500 ft., according to unofficial reports. Oil sand was also logged in the Pulv. zone higher up in the hole where a well can be obtained, it is believed, should the Jewett test prove unsuccessful. The well is nearly 2 miles northwest of production.

WESTERN CANADA

ALBERTA

Tennessee Gas Transmission Completes First Alberta Well

Tennessee Gas Transmission Co. has completed its initial wildcat try in Alberta as a successful Viking gas producer. The well, 10 Summer, LSD 10, 23-35-7w4, in the Consort area, also gave up some oil on drill-stem test.

This discovery was completed at total depth 2,900 ft. Gas flowed at the rate of 5,700 M.c.f. per day.

Step-Out Well Finaled In Westward Ho Area

Home Oil Co., Ltd., Federated Petroleums, Ltd., and Alminex, Ltd., re-

HOW TO—

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Rockwell-Built **MUDWONDER**
Valves for ALL Mudline Services

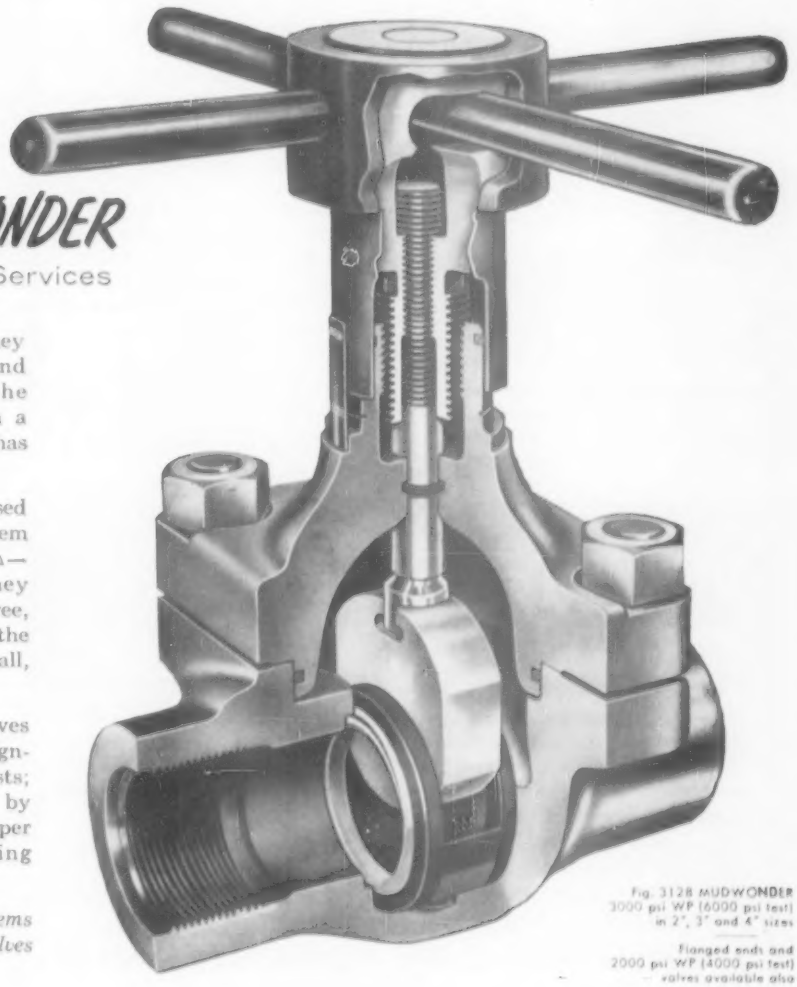

Fig. 3128 MUDWONDER 3000 psi WP (6000 psi test) in 2", 3" and 4" sizes

Flanged ends and 2000 psi WP (4000 psi test) valves available also

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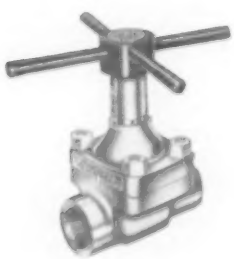
You can expect the Rockwell-Built MUDWONDER to: SLASH DOWNTIME ... CUT MAINTENANCE ... GIVE LONGER SERVICE ... OPERATE EASIER, FASTER ... KEEP MUDLINES INTACT ... STOP SANDING-UP



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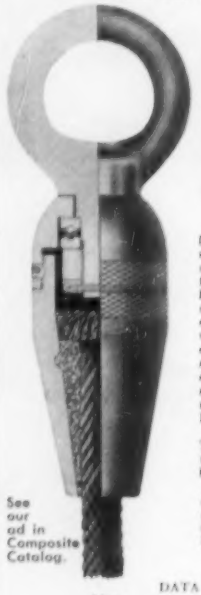

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Designed for use in using wire lines instead of manila rope for cat lines. Wire line is babbitted in socket end for use over the derrick while sufficient length of manila is used in ring end for use with cat head winch. This results in a safer and more economical cat line.

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	Line Size Up to	Weight Lbs.	Over-All Length, Inches	Breaking Strength, Lbs.
105	1¼"	4⅛	8⅛	40,000
105-A	1¼"	4¼	8⅛	40,000
106	1¼"	5¼	8½	60,000

L-K

Pump Valve Company

P. O. Box 901 Houston, Texas

ported successful completion of a step-out well in the Westward Ho area. This well, Oilwell Operators 3-7 Westward Ho, LSD 3, 7-33-4w5, flowed oil at rates up to 18.2 bbl. per hour on 24/64-in. choke from the Mississippian lime. This team is drilling another pair of offset wells to the Westward Ho discovery.

Whitecourt D3 Discovery Coring Ahead for More Tests

The team that discovered gas-condensate in the top of the D3 zone of the Devonian at its wildcat in the Whitecourt area has tested 58 ft. of gas-bearing sand and had cored ahead to 8,500 ft. and was testing at last report, 126 ft. below the D3 contact.

The discovery well, Fina-Stanolind-Hudson's Bay 12-36 Windfall, located on LSD 12, 36-59-15w5, is 110 miles northwest of Edmonton and 70 miles southeast of Sturgeon Lake oil field. Initial drill-stem test last week flowed gas at rate of 3,040 M.c.f. per day with recovery of 360 ft. condensate reported. Second test in the D3 also flowed gas at a maximum rate of 9,600 M.c.f. per day. When pipe was pulled it contained 450 ft. of condensate. The last test, bottomed at 8,432 ft., flowed gas at the maximum rate of 4,840 M.c.f. per day. Pipe recovery was 510 ft. condensate.

The discovery well is being backed 41⅔ per cent each by Stanolind, Hudson's Bay, and 16⅔ by Canadian Fina Oil, Ltd. This team holds 1,100,000 acres of reservation lands in the area, comprised of eleven reservations.

ROCKY MOUNTAIN

COLORADO

Baca County Wildcat Flows Gas

Superior Oil Co. recovered gas on test of Cherokee at 44-6 Stalford, SE SE NW 6-35s-41w, Baca County. The operator reported a flow at the rate of 481,000 cu. ft. per day on test at 3,689-3,704 ft. An earlier drill-stem test flowed at the rate of 1,020,000 cu. ft. per day after 1 hour. The well is 16 miles south of production in South Greenwood field. While recovery is not high, on tests to date, the promise of a considerable expansion of the county's producing area has attracted considerable attention to tests already run. Superior topped Cherokee at 3,718 ft., and found top of Mississippian at 4,705 ft. Testing continues at this well.

Mesa County Wildcat Testing

A second rank wildcat in Colorado has attracted interest with gas recovery. Victor Drilling Co. and Union Oil Co. gaged a flow of nearly 200,000 cu. ft. of gas per day on drill-stem test at 1 Gunderson, NE NE NE 20-9s-93w, Mesa County. The operators have run pipe. Total depth is 7,482 ft., and pipe is set to 7,120 ft. The well is 19 miles south of Rifle, in an area which has had no previous drilling. Tops are not yet reported.

Morgan County Tight Hole Is Possible Discovery

Trigood Oil Co. of Casper is reported testing "D" sand at 1 Chase, C NW SW 9-2n-56w, Morgan County. The well had oil and gas shows in "D" sand, but results of cores and tests have not been released. Total depth of the wildcat is 5,616 ft. Location is 2 miles from North Gary production.

Logan County Discovery Shut In At Completion

Herndon Drilling Co. reported a gage of 1,600,000 cu. ft. of gas per day at completion of 1 Sprague, C SW SW 24-11n-55w, Logan County. The well is

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- Compact, rugged, self-contained unit—few working parts
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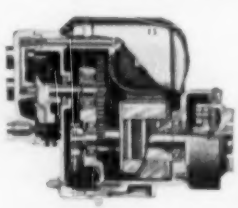

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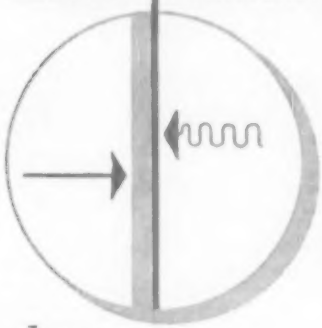

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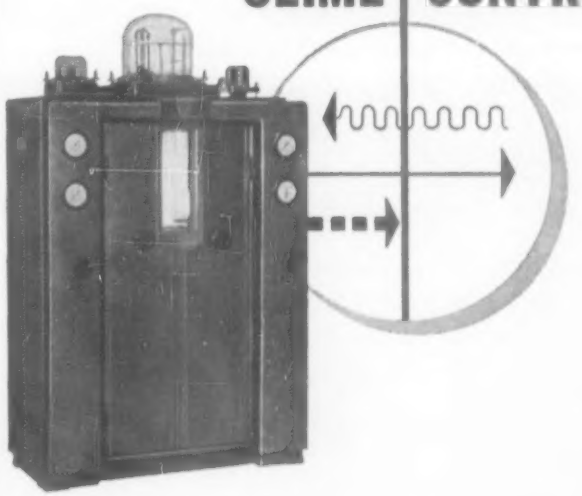

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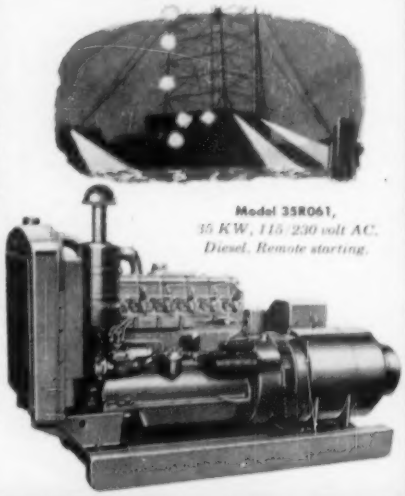

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a discovery in "J" sand at 5,437-55 ft. It was completed as a shut in gas well. The new producer is 8 miles east of Battle Canyon field.

NEBRASKA

15 Bbl. Swab Rate Reported At Banner Discovery

Petroleum, Inc. swabbed at the rate of 15 bbl. of oil per hour for a period of nearly 24 hours at 1 State-A, C NE SE 16-18n-56w, Banner County. The "J" sand zones 6,538-42 and 6,550-64 ft. were perforated for the test. The swab gage is the first testing of this discovery since drill-stem test at 6,534-53 ft. recovered 4,230 ft. of oil in 2¼ hours. At last report the operator was continuing swab tests. The well is 2 miles southwest of production in Downer field, and generally west of production through the rapidly developing Harrisburg area of Banner County.

Oil Recovered on Test of Kimball County Wildcat

Wytex Service Corp., Rex Monohan and Anderson-Prichard Oil Corp. recovered oil on two drill-stem tests in "J" sand at 1 Madden, SW SW NE 27-14n-54w, Kimball County. A test at 5,991-6,017 ft. recovered 60 ft. of oil, 110 ft. of heavily oil-cut mud and 200 ft. of muddy water in 2½ hours. Another test at 5,993-6,017 ft. the 2-hour recovery was 295 ft. of oil, 135 ft. of oil-cut mud and 5 ft. of water. Flowing pressure was 190 psi. at the end of the test. The possible discovery is 2 miles southeast of South Dix.

WYOMING

Pipe Set at West Poison Spider New Pay Discovery

Pure Oil Co. has run pipe to 10,220 ft. at 2 West Poison Spider unit, C NW NW 11-33n-84w, Natrona County. The operator recovered 825 ft. of oil on test of Cody sand at 10,146-96 ft. Test had a flow of gas at the rate of 115,000 cu. ft. per day after 8 minutes. Previous total depth of this well was 9,288 ft. and deepening was intended to test Frontier. Completion is now planned in Cody sand.

Clark Ranch Tests Finds Frontier Gas

Houston Oil Co. recovered gas at a rate reported at more than 1,000 M.c.f. per day on test of Frontier sand at 3 Unit, N½ SE SW 6-35n-84w, Natrona County. The well is the third test of

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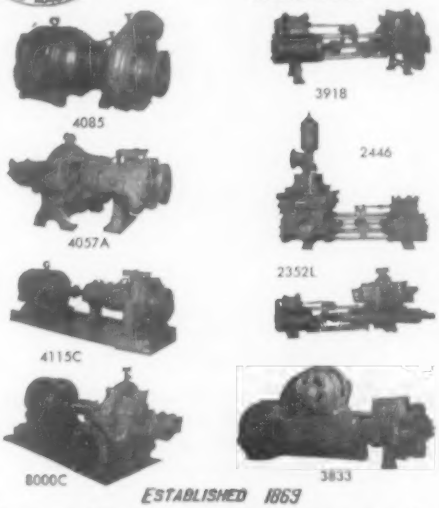

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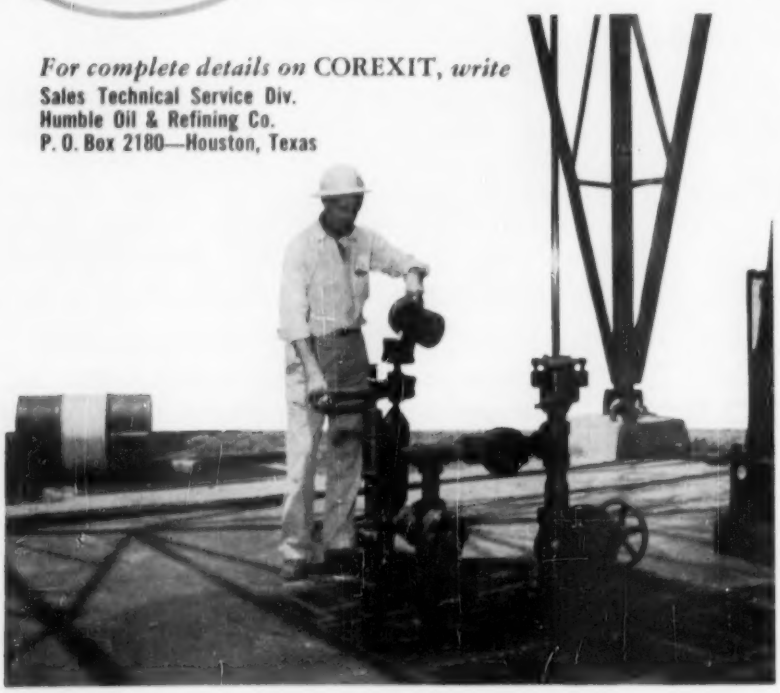

the Clark Ranch unit, and if production from Frontier is commercial it will be the third pay zone for the unit. Test was reported at 789-821 ft. with tool open 3 hours. Pipe recovery was 350 ft. of gas-cut mud. Flowing pressure was 275 psi. at the end of the test, on ¼-in. choke. Another test in Frontier at 914-45 ft. flowed at the reported rate of 1,250,000 cu. ft. per day, with 200 ft. of gas-cut mud recovered in pipe at the end of the 1-hour test. Flowing pressure was 430 psi., also through ¼-in. choke. The reported results of neither of these tests have been confirmed by the operator.

The operator drilled in a Tensleep oil discovery on this unit earlier.

UTAH

San Juan County Gas Discovery Tested

White Canyon Uranium Co. recovered gas at a rate estimated at 2,000 M.c.f. per day from a wildcat in the Monticello area of San Juan County. The well is 2 Sitton, SE NE 20-33s-25e, 8 miles east and slightly north of the Utah town. Test was of the zone 5,174-5,202 ft. Gas flowed after 4 minutes of the 2 hour, 35 minute test. Recovery in pipe was 193 ft. of mud. Flowing pressure is not reported, nor have tops been reported. The well is scheduled as a test of Paradox at about 5,900 ft. With the exception of a single failure, no other drilling has been done within a considerable radius of the apparently successful wildcat. The operator is coring below 5,300 ft.

MONTANA

Confirmations Near Decisive Points in Several State Areas

Confirmation wells in recently discovered fields are near decisive depths in several areas, with other new confirmation locations just announced. Apparently important discoveries have been made in several areas of the state during 1955, with a considerable amount of attention now focused on the confirmation drilling.

- At Bredette, Roosevelt County, The California Co. is preparing to run drill-stem test of 1 Tribal-13, C SE NW 19-32n-50e. The well is bottomed at 6,540 ft., in limestone with good fluorescence, odor and stain cored at 6,545-50 ft. Location is ¾ mile southeast of the discovery well in this area which was completed by this operator for a flow of 140 bbl. of oil per day.
- Sun Oil Co. and Phillips Petroleum Co. are continuing tests at 1 D. Dynneson, SW SE 30-24n-58e, in the Brorson area of Richland County. Tests are

of Red River. The field has production from both Red River (Ordovician) and from Madison, but the current well is the second to the deeper formation. Its original intended confirmation was completed in Madison as a new pay discovery. The operators reported a flow of 85 bbl. of oil per day at the confirmation at the last reported test. Production is from the interval 12,624-54 ft.

Successful Wildcats

SOUTHWEST TEXAS

Jim Hogg County: Wymore Oil Co. 1 Yeager, Sur. 167, A-28. IPP 20 BOPD, 40.9°, perforations 3,149-53 ft. (Loma Novia sand). TD 3,149 ft. (New field.)

TEXAS GULF COAST

Brazoria County: General Crude Oil Co. 1 fee, Williams Robbins Sur., A-123 (south flank Damon Mound salt dome). IP 89.39 BOPD, ⅛-in., 29.5°, perforations 4,844-51 ft. TD 6,071 ft. (New pay in Damon Mound field.)

John H. Caldwell 1 Caldwell Ranch, Francis Bingham Sur., A-43. IP 206 BOPD, ⅛-in., 32°, perforations 7,872-75 ft. TD 8,302 ft. (New pay in Juliff field.)

Goliad County: Sunray Mid-Continent Oil Co. 1 Pettus, Maria de Jesus Y'Barbo Sur., A-51. IP 35.94 BOPD, 3/16-in., 36.8°, perforations 7,688-96 ft. (Mackhand sand). TD 8,805 ft. (New field.)

Harris County: Claud B. Hamill and Lenoir M. Josey, Inc., 1 Logenbaugh, A. Roberts Sur., A-648. IP 2,900 M.c.f. daily, open-flow potential, GCR 52.3 M.c.f. per barrel, 54.2°, Yegua 6,794-98 ft. (perforations). TD 7,076 ft. (New pay in Cypress field.)

Kenedy County: Humble Oil & Refining Co. 9 Armstrong, Barreta Grant. IP 10,000 M.c.f. daily, GLR 81.5 M.c.f. per barrel, 50.7°, perforations 8,121-27 ft. TD 10,000 ft. (New pay in Barreta field.)

Live Oak County: F. W. Carr 1 McGuffin, Jane Curry Sur., A-143. IP 98 BOPD, ⅛-in., 53°, perforations 5,351-55 ft. TD 5,413 ft. (New field.)

Matagorda County: Humble Oil & Refining Co. 1 Huebner et al, E. Hall & Peter Bertrand Sur. IP 97.43 BOPD (net), 60 per cent water, 3/16-in., 37°, Frio perforations 8,444-48 ft. and 8,455-64 ft. TD 10,701 ft. (New pay in Lucky field.)

San Patricio County: Edwin L. Cox 1 Womack, R. Sadler Sur., A-233. IP 92.5 BOPD, 3/32-in., 37.5°, perforations 6,791-93 ft. TD 9,182 ft. (New field.)

Victoria County: Stanolind Oil & Gas Co. 1 Moritz, Patrick Dowlearn Sur., A-157. IP 20,000 M.c.f. daily, open-flow potential, GOR 30 M.c.f. per barrel, perforations 8,590-8,600 ft. (Massive A-1 sand). TD 9,415 ft. (Discovery well South Meyersville field.)

Morgan Minerals Corp. 1 Adcock, L. Navarro Sur., A-89. IP 4,300 M.c.f. daily, open-flow potential, GOR 34 M.c.f. per barrel, 55.4°, perforations 8,414-28 ft. Wilcox). TD 9,017 ft. (New field.)

EAST TEXAS

Cherokee County: Humble Oil & Refining Co. 1 Wipprecht, Thomas Stanford Sur., A-758, 6 mi. E Dottie Sue field. IP 11,800 M.c.f., plus 3 bbl. distillate per 1,000 M.c.f., 50°, GLR 329,000:1, rock pressure 3,603 psi. Upper Pettit 8,468-98 ft. TD 9,065 ft.

WEST CENTRAL TEXAS

Shackelford County: Ernestine Callihan 1 Roark, 55-12-ETRR, 18 mi. E Abilene. IPP 20 BOPD, 36°, GOR 100, Tannehill sand 1,508-13 ft. TD 1,616 ft.

Jones & Stasney 1-A Dawson & Conway, Sec. 161, ETRR Sur., 19 mi. NW Albany. IPP 49 BOPD, 36°, GOR 675, Bluff Creek sand 1,444-60 ft. TD 1,680 ft.

Stephens County: Cannon Drilling Co. 2 Thompson, 16-4-T&P, 10 mi. NE Breckenridge. IP 191 BOPD, 20/64-in., TP 220 psi., 38°, GOR 375, Strawn sand 28,364-68 ft. TD 3,695 ft.

Taylor County: George S. Anderson 1-A Landers, M. P. King Sur. 431, 2 mi. S Lawn. IP 174 BOPD, 22/64-in., TP 280 psi., 40°, GOR 450, lower Gardner sand 4,046-59 ft. TD 4,092 ft.

Throckmorton County: M. T. Oil Co. 2 Daws, Sec. 772, TE&L Sur., 13 mi. SE Throckmorton. IPP 131 BOPD, 41°, GOR 300, Caddo limestone 3,940 ft. TD 3,968 ft.

Nolan County: British American Oil Producing Co. 2 Feldman, 31-1A-H&TC, 6 mi. E Blackwell. IP 612 BOPD, 22/64-in., TP 400 psi., GOR 930, 47.9°, pay 5,430 ft. TD 5,825 ft.

C. L. Norsworthy 1 Howard, 66-22-T&P, 5 mi. SW Sweetwater. IP 157 BOPD, ½-in., TP 60 psi., GOR 550, 42°, pay 6,663 ft. TD 6,688 ft.

NORTH TEXAS

Grayson County: Frank W. Bodle et al 1 S. E. McGuire, 6 miles northwest of Sherman in the J. B. Terry Sur., A-1271. IPF 420.3 BOPD, 10,294-10,334 ft., 18/64-in. choke, 32.3°, TD 10,420 ft.

Montague County: The Texas Co. 6 H. S.

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Henley, 3 miles southwest of Spanish Fort in F. Robertson Sur. A-620. IPP 9 BOPD, 1,440-48 ft., 24.3°. TD 1,500 ft.

Wilbarger County: Perry Browning 1 Louis L. Parth Trustee, 10 miles southeast of Harrold in 12-5, H&TC. IPP 32 BOPD, 3,842-52 ft., 40°. TD 4,595 ft.

Wise County: Nortex Oil & Gas Co. 1-Unit T. G. Rogers, 3 miles northeast of Bridgeport in J. Wallace Sur. A-888. IP 980 M.c.f. per day plus 24 BDPD, 5,433-39, 5,504-12, 5,606-09, 5,769-75 and 5,997-6,002 ft. TD 6,210 ft. (Gas-distillate discovery).

WEST TEXAS

Reagan County: Plymouth Oil Co. 1-R University, 17-48-University Lands, 13 miles SE Big Lake. IPP 52 BOPD, 30.6°, GOR 150, pay 2,516 ft. TD 2,624 ft.

MISSISSIPPI

Jefferson County: Central Oil Co. and R. M. Moon 1 Guidon, 24-9n-2w. IP 133 BOPD, 5/32-in., 40.6°, Artman (Wilcox) sand 5,432-35 ft. (perforations). TD 6,095 ft. Elev. 209 ft., Wilcox 3,750 ft., base Big shale 5,098 ft. (Second well and new pay in North Church Hill field.)

SOUTH LOUISIANA

Lafourche Parish: Sinclair Oil & Gas Co. 1 State Lease 2490, Block 15, Timbalier Bay area, Gulf of Mexico. IP 138 BCPD and 1,680 M.c.f. daily, ¼-in., 55.2°, perforations 11,986-96 ft. TD 13,756 ft. (New offshore field.)

Kerr-McGee Oil Industries, Inc., 1-A State Lease 1268, Block 47, Main Pass area, in Breton Sound. IP 187 BOPD, 5/32-in., 30.2°, perforations 8,192-8,201 ft. and 8,212-18 ft. TD 8,600 ft.

NORTH LOUISIANA

Bossier Parish: New pay at South Sarepta field. N. V. Kinsey and N. V. Kinsey, Jr. 1 C. A. Antrim, C SE SE NW 30-22n-11w. IP 4,500 M.c.f. per day plus 25 BC per million, 65.6°, Gray sand 11,494-11,514 ft., 11,324-44, 11,352-60, 11,269-79 and 11,253½-56 ft. TD 11,688 ft.

ARKANSAS

Miller County: Hill sand discovery in Kiblah field. David Crow, Trustee 1 Martin Tisdale, 8-20s-26w. IPF 41 BOPD, ¼-in. choke, 43°, Hill sand 5,947-50 ft. TD 6,159 ft.

OKLAHOMA

Garvin County: Daube-Tide Water 1 Boxley, SW NE SE 4-2n-3e. IPP 14½ BOPD, McLish sand 1,424-28 ft., 24°. TD 1,986 ft. (Oil discovery.)

R. L. Parker-Allen Humphrey 1 Gregory-Beck, 2 miles west of the Golden Trend in C SW NE 8-3n-4w. IPF 100 BOPD, Hart sand 9,178-9,239 ft., 40.3°, 12/64-in. choke. TD 9,401 ft. (Oil discovery.)

Love County: Frankfort Oil Co. 1 Conrad, NW NW NW 34-6s-2e. IPP 23 BOPD, Viola lime 6,130-80 ft., 33°. TD 8,595 ft. (Geological wildcat zone discovery.)

Osage County: Ramsey 1 Osage, SW SW NE 23-25n-7e. IPP 26 BOPD, Miss. chat 2,645-33 ft., 41°. TD 2,695 ft. (Oil discovery.)

CALIFORNIA

San Benito County: Long & Hedges, 1-A H&H, SW NE 5-17s-11e, IPF 250 BOPD, 34.5° gravity, 18/64-in. choke, 200 psi. tubing pressure, perfs. 5,230-70 ft. TD 5,312 ft. (New field discovery, Eocene sand, in Vallecitos area.)

Orange County: C. O. Cunningham, 1 Sutherland, NW NE 12-6s-11w, IPF 360 BOPD, 20° gravity, 12/64-in. choke, 720 psi. tubing pressure, 400 psi. casing pressure, perfs. 2,725-60 ft., TD 2,830 ft. (New fault block discovery in West Newport field.)

KANSAS

Graham County: Jones, Shelburne & Farmer 1 Brown, SW SW SW 19-6s-25w. IPP 98 BOPD, Lansing lime 3,740-44 ft., 38°. TD 4,098 ft. (Opens Allodium pool.)

Reno County: Globe 1 Hornbaker, SE NE NE 29-25s-6w. IPP 141 BOPD, Misener sand 3,992-98 ft., 36.7°. TD 4,106 ft. (Oil discovery.)

NEBRASKA

Banner County: Garfield & Pasternak 1 E. Brown, C NW SW 14-18n-54w. IP 8 BOPD, "J" sand discovery, new field. TD 5,551 ft. "J" sand.

WYOMING

Big Horn County, Torchlight: Stanolind Oil & Gas Co. 1 Government, E½ NE NE 23-51n-93w. IP 1,013 M.c.f. of gas per day. TD 3,907 ft.

MANITOBA

Dome Naco 1-28 Harmsworth, LSD 1, 28-11-26w1. Crinoidal oil well. TD 2,035 ft.

ALBERTA

Tennessee Gas Transmission Co. 10 Summer, LSD 10, 23-35-7w4. Viking gas well. TD 2,900 ft.

New British-U. S. Smelting & Refining 11-17 Pakowki, LSD 11, 17-4-8w4. Bow Island gas well. TD 3,090 ft.

BRITISH COLUMBIA

Pacific 37 Fort St. John, LSD 2, 27-82-16w6. Permo-Penn gas well. TD 6,371 ft.

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PERSONALS

Borland Promoted

20-year veteran gets high Stanolind post in Canada

THOMAS C. BORLAND has had an eventful July so far for two reasons.

One, he was named division production superintendent for Stanolind Oil & Gas Co.'s Canadian division. Two, he celebrated his twentieth anniversary with the firm he joined in July 1935 as a roustabout in the East Texas field.

Borland came by his petroleum career honestly right from the beginning. He was born in Oil City, Pa., one of the original centers of oil activity in the United States.

He entered Cornell University at Ithaca, N. Y., in 1931 and left 4 years later with a B.S. degree in mechanical engineering. However, his college life was not all work and no play, for mixed in among scholastic pursuits were 3 years of varsity rowing and a like amount of time as guard on the Ivy Leaguer's football team. In fact, Borland's rowing prowess won him the captaincy in his senior year.

Heads Southwest . . . After graduation, Borland packed his bag, tucked his sheepskin under his arm, and headed for the oil-producing Southwest. And there, with the exception of his wartime service and the past couple of months in Canada, he stayed.

He won his first promotion from a roustabout to a petroleum engineering assignment in 1937 and served in this position in East Texas and Spindletop until 1940. He was then named field engineer of the Turtle Bay area near Anahuac, Tex., from 1940 to 1942.

Uncle Sam needed his engineering knowledge about this time so Borland joined the Seabees, the construction men of the Navy, as a lieutenant j.g. in August 1942. He served with one of the first Seabee units sent to the Pacific theater and was returned to inactive duty in December 1945 as a lieutenant commander.

Postwar career . . . He resumed his Stanolind career as a petroleum engineer at headquarters in Tulsa. However, his service there was short-lived, and in June 1947 he was sent to Houston as district engineer.

He then advanced to assistant division engineer and division engineer at Houston before being sent to Oklahoma City as assistant division production superintendent of the central division in 1951.

Borland's Oklahoma City stay was ended in May 1955 with promotion to assistant division production superintendent of the Canadian division. There after 2 months' service, he was boosted to superintendent.

He married in 1946. The Borland family also includes his wife, Willie, and three children, Candace, 7, Frederika, 4, and Tag, 2.

Still sports-minded, Borland now plays tennis and swims. He is an active member of the American Petroleum Institute, Canadian Petroleum Association, and the Petroleum Club of Calgary.

Charles R. Criss, senior engineer in Sohio Petroleum Co.'s Oklahoma City engineering headquarters, will be transferred August 1 to district engineer in the Centralia, Ill., district. The Centralia post has been vacant since the transfer of **Paul Luckhardt** to the Okmulgee, Okla., area.

Harry A. Trueblood, Jr., of Denver, has been named president of Rimrock Drilling Co., Inc., Denver, upon reorganization of the company by Western Central Petroleums, Inc., New York, and the eastern firm's subsidiary, Colorado Western Exploration, Inc., Denver.

A. E. MacKay has been appointed chief production engineer in the operations department of Canadian Export Gas, Ltd., Calgary. Prior to joining Canadian Export last year, MacKay was a petroleum engineer located in Calgary. **R. W. Ham** has joined Canadian Export as drilling and production superintendent for Southeast Alberta with headquarters at Brooks, Alta.

Dr. Don B. Gould, formerly chairman of the geology department at Colorado College, Colorado Springs, has joined Geophoto Services, Denver, as an administrative geologist.

Shermer L. Sibley, engineer and assistant to the president of Pacific Gas & Electric Co., has been appointed vice president and assistant general manager of the company. Sibley became associated with P. G. & E. in 1936. He served in engineering capacities until he was promoted to office assistant to the vice president and general manager in 1946. Last year he was named assistant to the president.

J. F. Peery has been appointed manager of the oil and gas department of Texas Gas Corp. and its subsidiaries, New Ulm Corp. and Texas Gas Pipe Line Corp. Peery will headquarter at the company's offices in the New Ulm field, New Ulm, Tex. He formerly was field superintendent for New Ulm Corp.

Frank E. Lewis, chief geologist for Southern California Petroleum Corp., will soon return from Egypt to Denver to supervise the geological phase of the company's Rocky Mountain operations. He has been with International Egyptian Oil Co., Inc., in Cairo for 2 years.

J. F. Skidmore has been appointed manager of planning and development of Kentucky West Virginia Gas Co., a subsidiary of Equitable Gas Co., Pittsburgh. He will headquarter at Ashland, Ky., and will supervise all engineering, geological, and related functions for Kentucky West Virginia Gas. Skidmore was assistant to the operating manager of Equitable prior to his promotion.

Arthur E. Bone, president of Eastern Propane Co., Malvern, Pa., and **K. H. Dickson,** president of Uregas Service, Inc., Moberly, Mo., have been named to the National Council for L.P.-Gas Promotion by the Liquefied Petroleum Gas Association. Bone was also named a vice president and member of the executive committee. **Frank Perry,** vice president of Cities Service Oil Co., Bartlesville, Okla; **H. W. Rigterink,** Solgas division manager of Sun Oil Co., Philadelphia; and **Paul Bagley,** sales manager of Lone Star Producing Co.,

PERSONALS

Dallas, have been named to the council by the Natural Gasoline Association. **Harold E. Jalass,** vice president of Cribben & Sexton Co., Chicago, was designated by the Gas Appliance Manufacturers Association. The three associations are cosponsoring the L.P.-Gas Promotional Program.

Loren L. Buck has resigned as project engineer for Stanolind Oil & Gas Co. to accept the position of staff assistant to **E. J. Mills,** manager of the natural gasoline division of Sunray Mid-Continent Oil Co., Tulsa. Buck had been with Stanolind since 1946.

John B. Dunbar has been appointed by the Asphalt Institute to fill the new post of district engineer for Alabama and Tennessee. His appointment brings to 24 the number of field engineers employed by the institute. Dunbar will serve in New York under **Herbert Spencer,** division engineer.

A. E. Hall, formerly with Phillips Petroleum Co. at Bartlesville, Okla., has joined the production department of Sohio Petroleum Co. in Oklahoma City as special projects engineer. Hall replaces **L. F. Elkins,** who has become chief engineer.

C. W. Sanders, consulting geologist, has opened offices in Houston. Sanders was at one time a geologist with Shell Oil Co. In 1944 he moved from Houston to Fort Worth to take charge of exploration for Danciger Oil & Refining Co. After leaving Danciger in 1948, he organized and managed Greenbrier Oil Co., Mendota Oil Co., and La-Gorce Oil Co.

John Anderson has been named director of Shell Chemical Corp.'s newly formed rubber-manufacturing research laboratory at Torrance, Calif. Anderson has served as research director of Shell Chemical's Houston laboratory since 1948. Other appointments at Torrance include **D. S. Melstrom,** now head of the organic section in Houston, to head of the chemistry section; **F. D. Moss,** supervisor of experimental plants at Shell Development Co.'s Emeryville, Calif., plant, to head of the process and pilot plant section; **E. T. Bishop,** organic and applications department at Emeryville, to head of the product section; **L. R. Beason,** research chemist in the organic section in Houston, to group leader in the new chemical section; and **W. L. Holmes,** research technologist in Houston, to group leader in the process and plant section.

Norman J. Clark and **W. P. Schultz** petroleum engineers formerly associated with Humble Oil & Refining Co., have joined the engineering and consulting department of Core Laboratories, Inc., Dallas. Clark has been

N. J. CLARK

W. P. SCHULTZ

appointed assistant manager of the department under **W. L. Horner,** vice president. Clark was supervisory reservoir engineer for Humble in Houston, and Schultz was senior petroleum engineer in the Houston headquarters and at various district offices. Both also served as instructors in reservoir engineering to Humble engineers and supervisors.

Jack Corley, Sinclair Refining Co., formerly head of the technical department of the company's Sinclair, Wyo., plant, has been promoted to assistant plant manager.

Keith L. Rathbun, regional geologist for Continental Oil Co. in Los Angeles, has been promoted to manager of exploration for Conoco's western region, succeeding **R. M. Barnes,** who was promoted to senior consultant. **Richard B. Haines** has been advanced from assistant regional manager to succeed Rathbun.

W. Samuel Carpenter III has been named assistant director of E. I. du Pont de Nemours & Co.'s petroleum chemicals division, succeeding **M. H. Campbell,** who has been transferred to the new isocyanates sales section in the elastomers division. Carpenter was previously director of manufacturing for the cellulosics division of du Pont's textile fibers department.

Carey Croneis, Rice Institute, Houston, and **Theodore A. Link,** Link, Downing & Cooke, Ltd., Toronto, Ont., have been nominated as candidates for the presidency of the American Association of Petroleum Geologists during 1956-57. Other nominees are **Ben H. Parker,** Frontier Refining Co., Denver, and **Walter H. Spears,** Union Producing Co., Shreveport, for vice president; **William A. Waldschmidt,** consultant, Midland, Tex., for secretary-treasurer, and **William C. Krumbein,** Northwestern University, Evanston, Ill., for editor. Election will be by mailed secret ballot. Winners will be announced early next February.

Allen Ehlers, consulting geologist of Midland, Tex., has been named chief geologist for American Trading & Production Corp., Midland. Prior to his independent practice, Ehlers was West Texas - New Mexico district geologist for Skelly Oil Co.

C. E. Cole, chief geologist for Arkansas Fuel Oil Corp., Shreveport, has been promoted to manager of the exploration division, succeeding E. L. Caster, who died recently. Cole will continue to serve as chief geologist. **L. A. Braly** has been named superintendent of the company's land department.

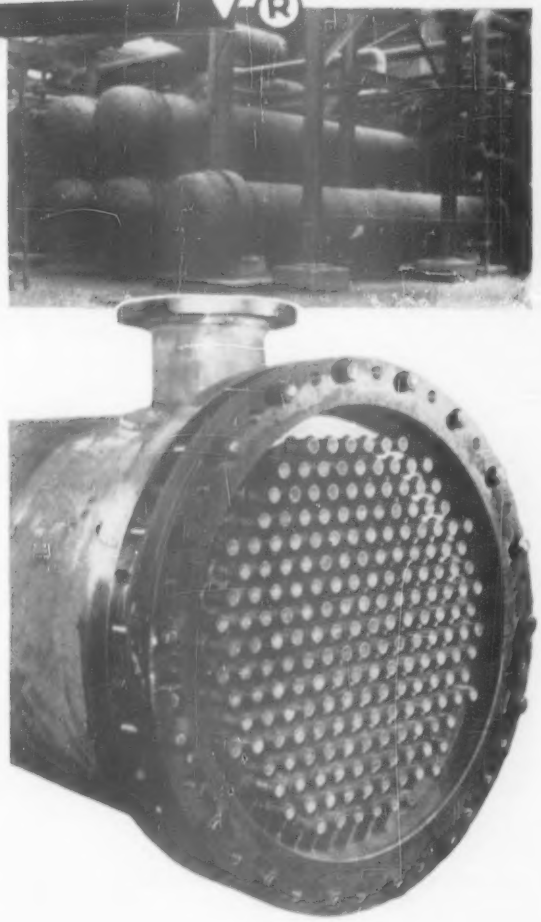
B. J. Pevehouse, district geologist at Midland, Tex., for Bay Petroleum Co. and later for Tennessee Gas Transmission Co. when that firm acquired Bay, has resigned to become a consulting geologist at Midland. Pevehouse joined Bay at Abilene, Tex., in 1948. He was transferred to Roswell, N. M., 2 years later and then to Midland in 1951.

Dr. Joseph George Davidson, vice president of Union Carbide & Carbon Corp., New York, has been chosen by the American Section of the Society of Chemical Industry to receive the Chemical Industry Medal for 1955. The medal is awarded annually in recognition of outstanding accomplishment in applied chemistry. Formal presentation will be made October 28 in New York. Dr. Davidson is recognized for research, production, and administration in synthetic-organic chemistry, particularly for his vital part in expanding the petrochemical industry.

John C. Ryan has been named district manager of Delhi-Taylor Oil Corp.'s newly consolidated district headquarters at Midland, Tex. The new district resulted from a consolidation of the former Midland and the San Angelo, Tex., district offices. Ryan was district geologist of the former Midland district. Being transferred from San Angelo to Midland are **C. W. Robinson,**

"Pack Off Your Troubles..."

SPENCER®



THE PROBLEM: One of Spencer Chemical Company's plants needed an air preheater to handle nitrogen gases at 1600°F. on the tube side, against air at 330°F. on the shell side. These widely different temperatures produced a 2" differential expansion between tubes and shell.

ENGINEERING: Western heat transfer engineers considered several possible solutions: a) An expansion joint in the shell; b) Individual tube packing; c) A packing gland in the shell.

CONSULTATION: These approaches were discussed with the Spencer engineers. After mutual examination of plant design problems, the individual tube packing method was chosen. Upon completion of the precision fitting and welding there was adequate room for expansion and contraction of the tubes within their individual packing glands.

IMPORTANCE: The Spencer Chemical Company job typifies Western's capabilities in working *with* the client to satisfactorily solve the specialized engineering and fabricating problems of today's high temperature, high pressure services.

WESTERN
HEAT EXCHANGERS

WESTERN SUPPLY COMPANY

P. O. BOX 1888 • TULSA, OKLAHOMA

HUDSON-RUSH COMPANY—753 Gladstone Blvd., Shreveport, La.
130 Casa Linda Plaza, Dallas 18, Texas
PROCESS INSTRUMENTS & EQUIP. CO. - North Bldg., Charleston, W. Va.
H. W. SEVERANCE—Marion E. Taylor Bldg., Louisville, Ky.

PERSONALS

staff geologist; **Ed Stiles,** district geologist; **A. F. Bolton,** district production superintendent; and **M. V. Roberts,** production foreman.

Bob Hippard, Shell Oil Co., has been named division exploration engineer at Odessa, Tex., replacing **Bob Brackbill,** who has been transferred to Midland, Tex., as production engineer.

E. F. Hindman, former general superintendent of two Louisiana subsidiaries of Texas Gas Transmission Corp., has been named manager of Texas Gas' newly created Louisiana division at Lake Charles. The division was formed following the recent absorption of Louisiana Natural Gas Corp. and Texas Northern Gas Corp. by the parent Texas Gas. Hindman joined Louisiana Natural in 1949 as pipeline superintendent and was appointed general superintendent the following year. He later served Texas Northern as general superintendent.

V. L. Keldsen, former manager of the production department in the ammonia division of Shell Chemical Corp.'s San Francisco offices, has been named head of the synthetic rubber section of the New York headquarters' manufacturing and development departments.

Gardiner Symonds, president of Tennessee Gas Transmission Co., has been named chairman of the board of the company's newly organized wholly owned subsidiary, Bay Petroleum Corp. Other officers of the new company are **R. R. Dean,** president; **R. C. Graham,** senior vice president; **Charles O. Garbrecht,** vice president; **C. C. Johnson,** vice president and treasurer; **Leo L. Leabo,** vice president; and **J. E. Ivins,** secretary.

C. W. Stephens, formerly division petroleum engineer in Ohio Oil Co.'s Los Angeles division, has been appointed senior petroleum engineer and will be assigned special duties by the division manager. **W. B. Emery II,** petroleum engineer at Bakersfield, Calif., has succeeded Stephens in Los Angeles. Stephens joined Ohio Oil as a geologist at Bakersfield in 1929, moving later to assignments at Venice and Santa Barbara, Calif., and Aberdeen, Wash. He has served as Los Angeles division petroleum engineer since 1941.

A. B. (Red) McCollum has resigned as president of Green Mountain Oil Co., San Antonio, and Reflectagraph Co., Lubbock, Tex., to become a consulting geologist in West Texas.

C. K. Shepherd, Denver, has been appointed manager of exploration for Egyptian-American Oil Co., in Cairo. Shepherd was formerly regional geophysicist for Conoco's Rocky Mountain region. Shepherd joined Conoco in 1937, was named geophysical supervisor at Lafayette, La., in 1948, and became Rocky Mountain regional geophysicist 2 years later.

Allen E. Behn, maintenance engineer at Standard Oil Co. of Ohio's Lima, Ohio, refinery for the past 5½ years, has been transferred to the petrochemical department's plant division as maintenance coordinator. **Jack A. Smith,** formerly assistant chief chemist for Phillips Chemical Co. at Dumas, Tex., has joined the technical staff in Sohio's petrochemical department at Lima as chief chemist.

Wayne L. McCann, petroleum engineer, and **R. Lee Rogers, Jr.,** petroleum geologist, have formed a consulting partnership in Shreveport. Both were formerly with Stanolind Oil & Gas Co.

Jack W. Roach, vice president of Deep Rock Oil Co., subsidiary of Kerr-McGee Oil Industries, Inc., has been made assistant to Deep Rock president **Frank Love.** Roach will coordinate the company's research and development and handle special projects. He will headquarter in Oklahoma City. **Robert M. Chesney,** also a vice president, who was formerly in charge of Deep Rock's Cushing, Okla., refinery, has been placed in charge of the Wynnewood, Okla., refinery, and will move to Oklahoma City to coordinate operations of the two plants.

DEATHS

John Francis (Frank) Cullinan, Sr., 77, Houston, pioneer Texas oilman and former vice president and director of American Republics Corp., died July 15 at Alexandria, Minn. He had been in retirement since 1953. A native easterner, Cullinan and his brother, J. S. Cullinan, formed J. S. Cullinan & Co. at Corsicana, Tex., around the turn of the century. They later organized Texas Fuel Oil Co., forerunner of The Texas Co., and were prominent in the Spindletop boom. Frank Cullinan served as president of Producers Oil Co., Texaco subsidiary, and when American Republics was formed he severed connections with the Texaco organization. Cullinan is also noted as having helped to write the rules and regulations of the Texas Railroad Commission.

Luis Herrera Figueredo, 49, executive assistant to the president of Mene Grande Oil Co., Caracas, died recently in Caracas. Prior to joining Mene Grande in 1946, Herrera was for 3 years director of the Technical Office of Hydrocarbons of the Venezuelan Government and on two occasions served as acting minister of development.

G. W. Johnson, 87, formerly with General Crude Oil Co., died recently at Dayton, Tex. Johnson is noted as having drilled some of the earliest wells in the Spindletop field.

Calouste Sarkis Gulbenkian, 86, international mystery man of oil, died July 20 in his suite at the Hotel Avis in Lisbon, Portugal. An Armenian by birth, Gulbenkian built a fortune of untold millions as a Middle Eastern oil promoter. He held a 5 per cent interest in Iraq Petroleum Co., which he gained before World War I when he helped organize the company under its original name, Turkish Petroleum Co. When the Turkish empire collapsed and Iraq was made a British mandate, British interests claimed oil rights by virtue of their share of the prewar Turkish Petroleum concession, in which Gulbenkian had his 5 per cent ownership. He held this percentage in 1929 when Iraq Petroleum was reorganized according to the "Red Line Agreement." Gulbenkian launched his oil dealings in London in the 1890's and became a British citizen in 1902. When Royal Dutch and Shell merged in 1907, Gulbenkian emerged as a major stockholder. He broke with Shell in 1926.

Myron K. Blackmer, 62, former vice president of Midwest Refining Co., Denver, died July 16 in a Denver hospital after an extended illness. He was associated with Midwest from 1920 until 1928, when he retired.

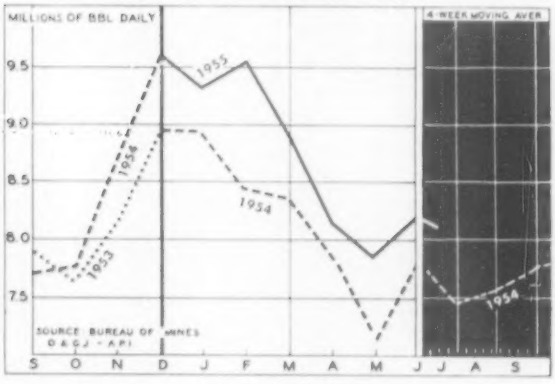
Melvin Leo Milton, 82, retired oil operator and geologist, died recently at Franklin, Pa. Milton retired 4 years ago.

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,617,200	UP	10,950	UP	352,480
Crude stocks	270,490,000	DOWN	2,821,000	DOWN	6,706,000
Completions	1,032	DOWN	131	UP	47
Refinery runs	7,582,000	DOWN	64,000	UP	613
Gasoline stocks	158,822,000	DOWN	485,000	DOWN	2,964,000
Distillate stocks	108,932,000	UP	3,765,000	UP	14,138,000
Residual stocks	45,482,000	UP	178,000	DOWN	7,873,000
Four-product stocks	344,617,000	UP	4,383,000	UP	4,364,000
Total imports	971,400	DOWN	269,200	DOWN	7,400

TOTAL DEMAND - ALL OILS



Distillate Production Increased Three Times as Much as Demand

DISTILLATE demand increased almost 5 per cent in the second quarter of this year, but stocks jumped more than 37,000,000 bbl. The big stock gain was due to high distillate yields from increased refinery runs.

Refiners ran 664,700,000 bbl. of crude in the second quarter of this year compared with 630,900,000 bbl. in the same quarter of 1954. This represents a gain of 5.3 per cent. But, distillate production totaled 142,399,000 bbl. this year for a gain of 13.3 per cent over production of 125,715,000 bbl. in the second quarter of last year.

The volumetric gain in distillate production in the second quarter amounted to 16,684,000 bbl. Increased demand for distillate took only 5,215,000 bbl. of this extra material, leaving 11,469,000 bbl. more for storage than was put in tanks last year. The second-quarter gain in distillate stocks this year was 37,524,000 bbl. compared with 26,055,000 bbl. for the second quarter of 1954.

Changes in production, demand, and stocks by districts are shown in the accompanying table. Demand figures by districts represent only the indicated demand on refineries of the districts since the totals are calculated from production totals and stock changes by districts. Larger Gulf-East Coast shipments account for the calculated decrease in demand for District 1 and the relatively large increase for District 3. Data on interdistrict movement of distillate in the second quarter are not yet available, so total district demands cannot be calculated.

District 3 accounted for almost 54 per cent of the total gain in production. Since refiners in this district accounted for only about 40 per cent of the extra distillate going to storage this year, heavy movement to the East Coast is indicated.

If high distillate production continues for the next 2 months, excessive stocks will increase the pressure on distillate markets.

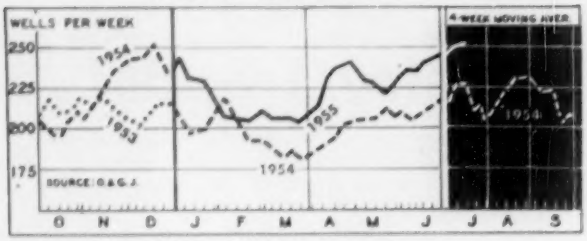
DISTILLATE STOCKS AND STOCK CHANGES
(Thousands of barrels)

	Stocks		Second quarter stock changes	
	7-8-55	7-9-54	1955	1954
District 1	36,793	31,370	11,512	8,549
District 2	32,751	28,510	14,290	10,842
District 3	22,580	16,973	9,880	5,237
District 4	2,362	2,301	296	263
District 5	10,681	11,565	1,546	1,065
Total U. S.	105,167	90,719	37,524	26,055

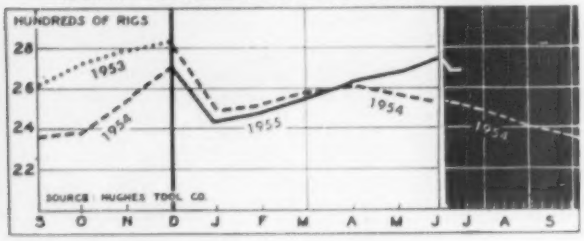
DISTILLATE PRODUCTION AND DEMAND ON REFINERIES FOR DISTILLATE
(Thousands of barrels)

	Production		Demand	
	Second quarter 1955	Change from second quarter 1954	Second quarter 1955	Change from second quarter 1954
District 1	24,314	1,805	12,802	—1,158
District 2	37,555	3,929	23,265	481
District 3	60,275	8,965	50,395	4,322
District 4	5,364	416	5,068	482
District 5	14,891	1,569	13,345	1,087
Total U. S.	142,399	16,684	104,875	5,215

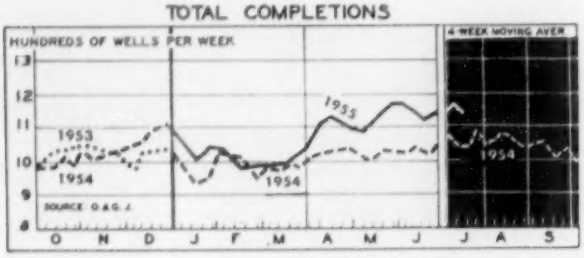
WILDCAT COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



TOTAL COMPLETIONS



ACTIVE ROTARY RIGS*

Area—	7-18-55	Change from 7-11-55	Change from 7-19-54
Gulf Coast	586	—7	40
N. and W. Texas-New Mexico	863	—4	85
Arkansas-N. Louisiana-E. Texas	153	—3	—23
Oklahoma	319	—1	38
Kansas-S. Nebraska	171	—2	2
Illinois-Eastern	155	7	14
Rocky Mountain	290	11	37
Pacific Coast	144	—1	23
Total United States	2,681	0	216
Western Canada	205	—4	57

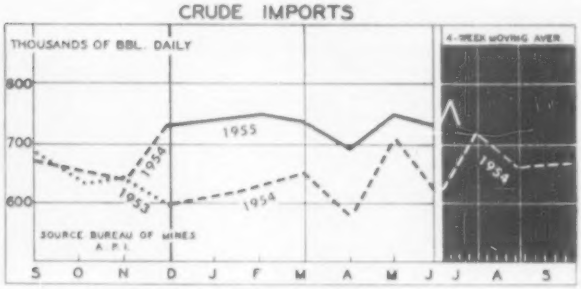
*Hughes Tool Co.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED JULY 16, 1955

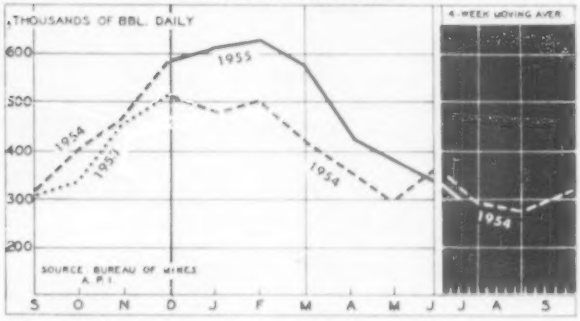
	Total of all wells: Comp.	Oil	Gas	Dry	Footage	Cum. 1955	Cum. 1954	Wildcat completions and discoveries: Oil	Dist.	Gas	Dry	Total	Cumulative total, 1955: Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	2	0	0	2	18,976	46	60	0	0	0	2	2	0	0	0	44	44
Arkansas	20	13	0	7	61,279	390	316	1	0	0	1	2	18	0	2	87	107
California	45	34	1	10	216,158	1,371	1,333	2	0	0	8	10	24	0	6	213	243
Colorado	27	4	0	23	140,884	743	711	0	0	0	19	19	24	0	17	378	419
Illinois	54	30	1	23	128,679	1,963	1,489	1	0	0	7	8	34	0	1	281	316
Indiana	12	5	0	7	16,084	405	440	0	0	0	4	4	8	0	0	169	177
Kansas	81	32	7	42	292,003	2,724	2,388	3	0	0	24	27	81	1	20	435	537
Kentucky	35	15	1	19	47,886	694	610	5	0	1	9	15	31	0	6	123	160
Louisiana	60	44	2	14	335,826	2,144	1,798	1	2	0	7	10	67	44	14	217	342
North	42	30	2	10	155,441	1,143	964	0	1	0	4	5	13	4	2	86	105
South	18	14	0	4	180,385	1,001	834	1	1	0	3	5	54	40	12	131	237
Michigan	6	1	0	5	14,334	221	295	0	0	0	2	2	6	0	0	103	109
Mississippi	12	7	0	5	114,481	262	210	1	0	0	3	4	12	0	0	90	102
Montana	2	1	0	1	6,555	164	146	0	0	0	1	1	5	0	1	47	53
Nebraska	21	7	0	14	120,930	399	192	2	0	0	9	11	22	0	0	164	186
New Mexico	53	27	19	7	153,675	856	593	0	0	0	4	4	20	1	6	68	95
Northwest	20	0	18	2	68,783	254	199	0	0	0	1	1	2	0	6	22	30
Southeast	33	27	1	5	84,892	602	394	0	0	0	3	3	18	1	0	46	65
North Dakota	8	5	0	3	61,629	127	140	0	0	0	1	1	1	0	0	23	24
Ohio	0	0	0	0	0	583	624	0	0	0	0	0	1	0	4	14	19
Oklahoma	144	104	3	[3]37	527,193	4,688	4,965	6	0	0	10	16	84	8	18	357	467
Pennsylvania-New York	22	6	6	[3]10	55,475	873	1,303	0	0	0	0	0	0	0	5	7	12
Texas	410	257	15	138	1,833,754	10,790	9,799	18	4	1	91	114	412	59	73	2,248	2,792
Southwest (1 & 4)	57	34	0	23	219,854	1,679	1,383	2	1	0	15	18	53	18	23	432	526
Gulf Coast (2 & 3)	49	21	3	25	320,782	1,373	1,428	4	3	0	18	25	49	32	25	349	455
East (5 & 6)	19	9	5	5	107,176	519	520	0	0	1	4	5	15	4	4	167	190
North Central (7-B & 9)	187	105	6	76	591,105	4,016	3,696	11	0	0	48	59	214	0	7	882	1,103
West (7-C & 8)	82	74	0	8	542,936	2,680	2,269	1	0	0	6	7	78	1	6	404	489
Panhandle (10)	16	14	1	1	51,901	523	503	0	0	0	0	0	3	4	8	14	29
Utah	1	0	0	1	4,082	38	36	0	0	0	1	1	3	0	2	23	28
West Virginia	4	0	3	1	12,656	323	286	0	0	0	0	0	0	0	8	10	18
Wyoming	13	4	1	8	53,978	412	737	0	0	1	7	8	12	0	5	90	107
Miscellaneous	0	0	0	0	0	17	83	0	0	0	0	0	0	0	0	13	13
Total United States	**1,032**	596	59	377	4,216,517	30,283	28,554	40	6	3	210	**259**	865	113	188	5,204	6,370
Total previous week	1,163	653	72	438	4,645,225			44	0	5	197	246	825	107	185	4,994	6,111
Total July 17, 1954	985	531	100	354	3,954,846			21	2	6	158	187	778	84	202	4,719	5,783
Western Canada	67	40	6	21	275,664												

[3] Service wells included: 2, 16.

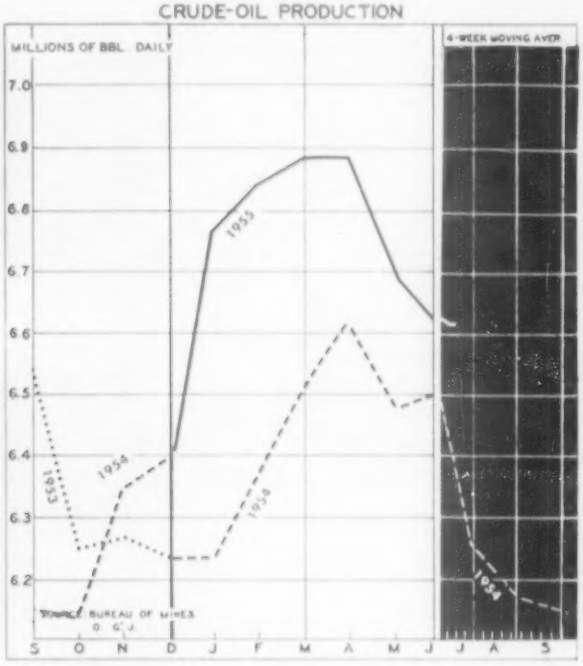
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE-OIL PRODUCTION

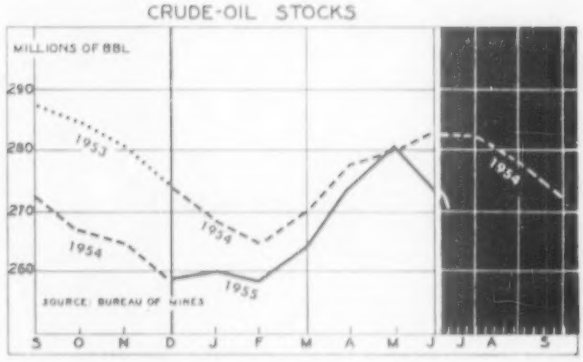


DAILY AVERAGE PRODUCTION FOR WEEK

	July 16			July 9
	Crude oil	Lease condensate	Total	total
Alabama	3,400		3,400	3,400
Arkansas	74,200	450	74,650	75,250
California	975,200		975,200	975,200
Colorado	145,700		145,700	144,900
Eastern	49,800		49,800	50,000
Florida	1,325		1,325	1,325
Illinois	229,800		229,800	242,000
Indiana	27,900		27,900	29,700
Kansas	320,600		320,600	313,800
Kentucky	40,400		40,400	40,300
Louisiana	660,850	56,950	717,800	717,850
North	113,850	2,950	116,800	116,850
South	547,000	54,000	601,000	601,000
Michigan	31,300		31,300	30,700
Mississippi	96,200	3,925	100,125	100,125
Montana	45,100		45,100	44,300
Nebraska	29,600		29,600	28,200
New Mexico	224,900	3,400	228,300	228,400
North Dakota	29,400		29,400	27,400
Oklahoma	555,300		555,300	543,200
Texas	2,675,700	47,700	2,723,400	2,723,400
Dist. 1	48,000	475	48,475	48,475
Dist. 2	132,700	7,100	139,800	139,800
Dist. 3	418,000	23,000	441,000	441,000
Dist. 4	223,000	5,000	228,000	228,000
Dist. 5	47,200	425	47,625	47,625
Dist. 6	114,500	4,750	119,250	119,250
East Texas Field	202,000		202,000	202,000
Dist. 7-B	139,500	50	139,550	139,550
Dist. 7-C	170,000	4,300	174,300	174,300
Dist. 8	900,000	2,000	902,000	902,000
Dist. 9	191,000	450	191,450	191,450
Dist. 10	89,800	150	89,950	89,950
Utah	5,600		5,600	5,800
Wyoming	282,200		282,200	280,600
Others	‡300		‡300	400
Total U. S.	6,504,775	112,425	**6,617,200**	6,606,250
Change from prev. week, up			**10,950**	
Canada	‡377,525		‡377,525	‡298,150
Total U. S. production, January 1-July 16			1,323,135,050 bbl.	
Same period last year (crude plus cond.)			§1,267,911,565 bbl.	

*Includes 19,829,000 bbl. condensate. ‡Week ended previous Monday. §S.D. 100, Nev. 200.

CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

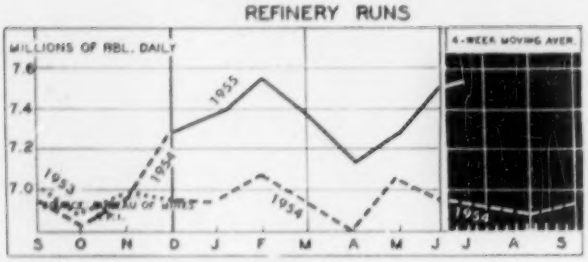
(Thousands of barrels)

	July 9, '55	July 2, '55	July 10, '54
Pennsylvania Grade	2,733	2,825	3,203
Other Appalachian	1,784	1,847	1,808
Illinois, Indiana, Michigan	11,419	11,751	13,176
Nebraska, North Dakota	1,623	1,866	(†)
Kansas	7,700	7,781	9,415
Oklahoma	22,839	23,112	27,101
Arkansas	2,850	2,775	3,507
Louisiana	16,065	15,998	16,645
North	2,829	2,902	2,555
South	13,236	13,096	14,090
Mississippi	3,101	3,002	3,294
New Mexico	8,454	8,538	7,352
Texas	128,055	128,902	129,948
East Texas proper	9,743	9,772	12,024
West Texas	57,200	57,602	55,344
Texas Gulf	25,538	25,728	28,398
Other Texas	35,574	35,800	34,182
Wyoming	15,265	15,788	13,962
Other Rocky Mountain	5,528	5,680	4,550
California	30,904	31,876	31,708
Foreign	12,170	11,570	11,526
Total	270,490	273,311	277,196

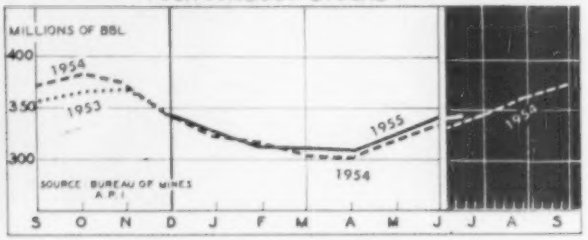
*Bureau of Mines. †Includes 2,761,000 bbl. in California. Included with Kansas.

CURRENT DATA ON RUNS AND PRODUCTION ARE 4-WEEK AVERAGES

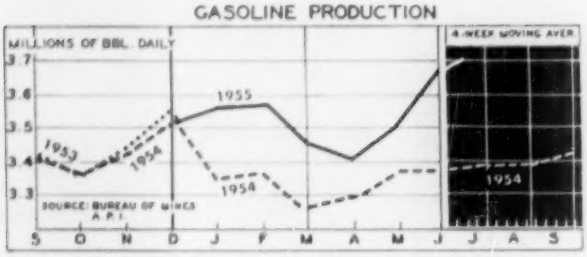
REFINERY RUNS



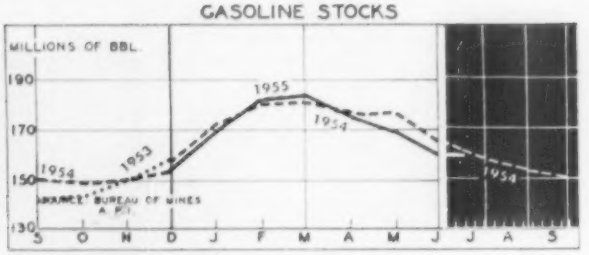
FOUR-PRODUCT STOCKS



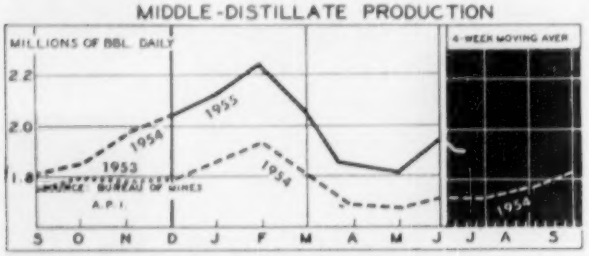
GASOLINE PRODUCTION



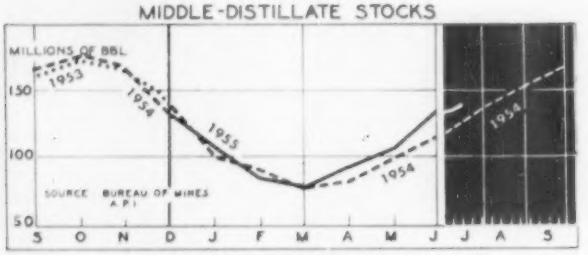
GASOLINE STOCKS



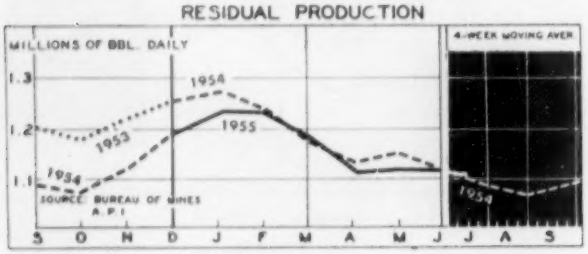
MIDDLE-DISTILLATE PRODUCTION



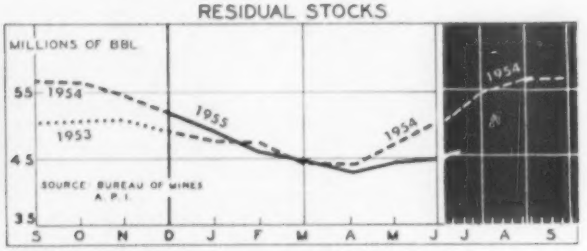
MIDDLE-DISTILLATE STOCKS



RESIDUAL PRODUCTION



RESIDUAL STOCKS



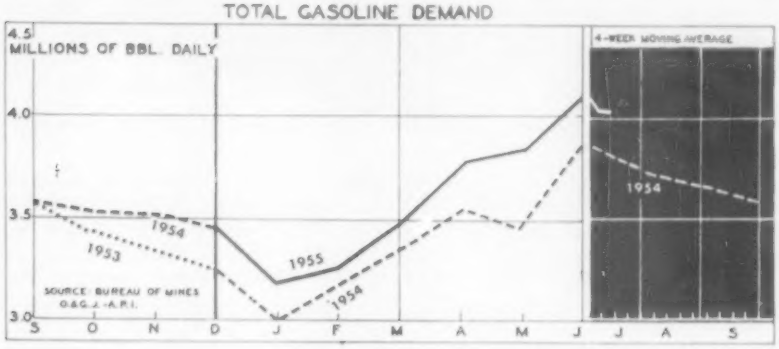
A.P.I. REFINERY REPORT, JULY 15

(Thousands of barrels)

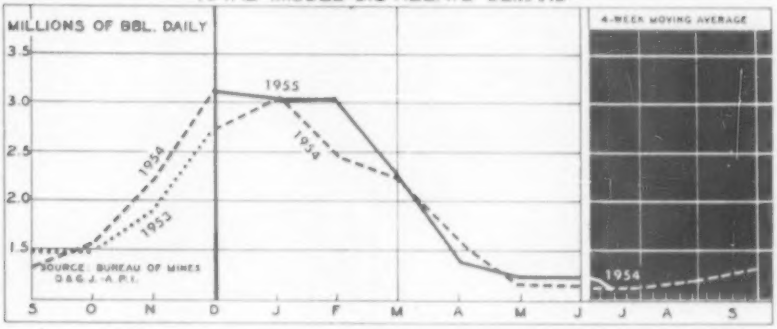
District—	Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.	Stocks‡—Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, July 1954—Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.
East Coast	1,106	425.9	30.7	250.3	187.9	35,441	12,469	35,899	10,508	1,073	441.0	29.9	241.9	210.9
Appalachian:														
District 1	92	39.3	2.4	23.7	3.1	4,248	524	2,493	349	100	43.9	5.1	20.5	5.5
District 2	101	56.3	1.6	22.3	11.4	2,297	484	881	328	89	48.6	2.2	13.2	10.5
Ind., Ill., Ky.	1,451	774.0	62.4	285.1	192.3	33,893	7,608	21,170	4,941	1,294	696.3	74.0	240.0	157.6
Okla., Kans., Mo.	662	387.4	17.2	155.0	41.0	14,883	1,970	12,096	1,106	600	342.5	14.6	135.2	32.8
Inland Texas	258	190.6	6.4	53.4	20.9	6,066	411	2,066	1,257	232	171.2	9.7	38.0	26.6
Texas Gulf Coast	1,804	863.7	87.9	429.7	253.2	21,298	3,972	13,226	4,599	1,595	790.4	94.5	370.6	213.1
La. Gulf Coast	621	308.1	51.7	140.9	56.7	9,697	2,249	5,877	1,552	565	264.2	54.2	135.2	41.3
N. La. and Ark.	88	32.0	7.0	18.3	5.3	3,782	1,022	2,073	60	90	34.6	7.5	21.2	6.3
Rocky Mountain:														
New Mexico	21	12.0	0.4	3.0	2.9	201	6	102	30	20	11.3	0.3	3.9	2.9
Other Rocky Mtn.	277	122.7	5.7	62.3	35.9	6,609	346	2,414	811	250	116.3	1.4	58.1	30.8
California	1,101	463.1	5.9	151.3	354.7	20,407	320	10,635	19,941	1,008	424.2	1.9	138.1	350.4
July 15, 1955	7,582	3,675.1	279.3	1,595.3	1,165.1	158,822	31,381	108,932	45,482	6,916	3,384.5	295.3	1,415.9	1,088.7
July 8, 1955	7,646	3,782.6	269.6	1,639.1	1,083.3	159,307	30,456	105,167	45,304					
July 16, 1954	6,969	3,405.3	303.1	1,440.9	1,127.9	161,786	30,318	94,794	53,355					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

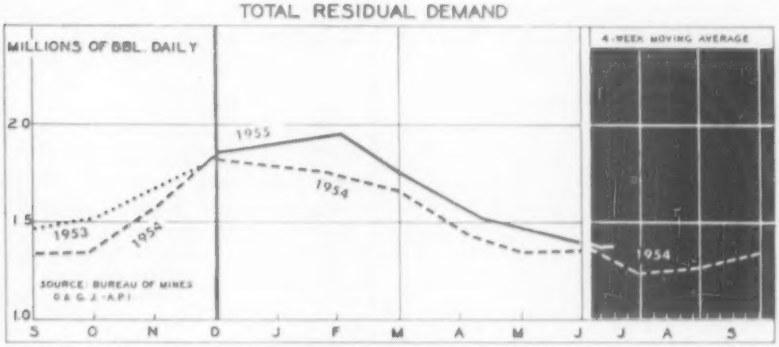
TOTAL GASOLINE DEMAND



TOTAL MIDDLE-DISTILLATE DEMAND



TOTAL RESIDUAL DEMAND



REPRESENTATIVE QUOTATIONS

Spot-market quotations of leading suppliers as of July 20, 1955. Prices are in cents per gallon, except for residual in dollars per barrel and wax in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline	10.75-11.25	11.25-12	10.25-10.75
Premium gasoline	12-12.5	13-13.75	11.50-12
42-44 w.w. kerosine	9.25-9.50	10.05	8.5-8.75
No. 2 straw fuel oil	8.25-8.50	9.3	8.0-8.25
No. 6 residual	$1.75-1.85	$2.50-2.70	$2.10-2.25

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	5.0	4.5	4.75
Grade 18-55	6.0	5.5	5.75

LUBRICATING OILS

Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	18
200 vis., No. 3 neutral, 0-10 pp.	13.25

WAX

Mid-Continent

132-134 A.M.P.	6.0

• Residual prices moved higher on the Gulf Coast under the influence of better prices on the East Coast. Most suppliers on the East Coast met the gasoline price change, including the cut in posting and withdrawal of voluntary discounts in price-war areas. The net result was higher prices in depressed areas. It is too early to tell whether these higher prices will hold.

PRODUCTION AND DEMAND—MAJOR PRODUCTS

(Thousands of barrels daily)

	Refinery prod.	Total demand
Gasoline:		
Four weeks ended 7-15-55	3,705	4,044
April 1955	3,502	3,786
June 1954	3,379	3,894
July 1954	3,384	3,723
Middle distillate:		
Four weeks ended 7-15-55	1,901	1,178
April 1955	1,847	1,489
June 1954	1,705	1,151
July 1954	1,711	1,105
Residual fuel:		
Four weeks ended 7-15-55	1,111	1,393
April 1955	1,100	1,553
June 1954	1,123	1,339
July 1954	1,089	1,226

CRUDE PRICES GRAVITY SCHEDULE

	Signal Hill, Calif.*	Okla-homa, Kansas	Gulf Coast Tex.†	West Tex.‡
14-14.9	$1.87			
15-15.9	1.93			
16-16.9	1.99			
17-17.9	2.05			
18-18.9	2.11			
19-19.9	2.18			
20-20.9	2.24	$2.50		$2.37
21-21.9	2.30	2.52		2.39
22-22.9	2.37	2.54		2.41
23-23.9	2.45	2.56		2.43
24-24.9	2.53	2.58	$2.91	2.45
25-25.9	2.61	2.60	2.93	2.47
26-26.9	2.69	2.62	2.95	2.49
27-27.9	2.76	2.64	2.97	2.51
28-28.9	2.83	2.66	2.99	2.53
29-29.9	2.91	2.68	3.01	2.55
30-30.9	2.97	2.70	3.03	2.57
31-31.9	3.04	2.72	3.05	2.59
32-32.9	3.12	2.74	3.07	2.61
33-33.9		2.76	3.09	2.63
34-34.9		2.78	3.11	2.65
35-35.9		2.80	3.13	2.67
36-36.9		2.82	3.15	2.69
37-37.9		2.84	3.17	2.71
38-38.9		2.86	3.19	2.73
39-39.9		2.88	3.21	2.75
40 and above		2.90	3.23	2.77

*Standard Oil Co. of California. †Upper Texas Gulf Coast. ‡Sour. Includes New Mexico Permian.

Effective dates: California, February 16, 1953; east of California, June 15, 1953; Pennsylvania Grade, July 11, 1955.

FLAT CRUDE PRICES

Representative posted schedules per barrel.

Louisiana:	
Cotton Valley (distillate)	$3.00
Cotton Valley (Holloway crude)	2.95
Texas:	
East Texas	2.90
Chapel Hill	2.83
Conroe	3.13
Van	2.73
Pennsylvania Grade:	
Bradford	3.60
Middle District	3.47
Southwest Pennsylvania	3.18
West Virginia	3.07
Buckeye Grade	3.01
Zanesville Grade	2.82
Illinois Basin	2.90

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Attn.: W. H. ORR
Phones: 132—Rockdale, Texas
AT-3427—Houston, Texas

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#517—O.C.S. Type 3 Single Drum Unit, with Friction Clutch and Mechanical Controls, Mounted upon 1942 Model LF Mack Truck with 11:00 x 24 tires. No mast or Supports. Good Running Condition FOB Odessa $1,497.44.

#525—Model 50/60 Ideco Unit Powered by BLD 525 Buda Engine, Butane equipped with 250 Gallon Tank. 5 x 7 x 55' Double Pole Mast. Mounted upon 1945 KB6 Tandem International Truck. Complete Unit in fair condition FOB Tulsa $6,000.00.

#515—Cardwell Model KL Double Drum Skid Spudder, Jaw Clutch, Mechanical Controls. Power Model GF-618 Buda Engine, Operates on Butane. 60' Derrick, Three-Sheave Crown, Cable Raised. Unit in workable condition. Engine in pretty fair shape. FOB Seminole $3,875.00.

#536—Franks Model ET-DC Single Drum Well Servicing Unit. Serial No. 301, with 8 x 10 x 62-ft. Single Pole Mast, Tw-Sheave Crown, Cross Sheave, Stinger and Block. Mounted upon International Truck 1941, Model K-8-F, with 450 engine, butane equipped and has two 115-gallon tanks side mounted. FOB Tulsa $7,298.85.

#540—Cooper Model UM Single Drum shop mod. Winch, Powered by Good VIKU Waukesha with V-Belt Driven Jackshaft. Unit Mounted upon 1950 Model 180 International Single Axle Truck Capable of 4000 foot Well Servicing. No Pole Mast. FOB Tulsa $2,500.00.

#541—Franks ET Serial 222, with 8 x 10 x 62-ft. Single Pole Mast, Divider, Grooved Jacket, Cathead, Mounted on 1948 Model K8 International Truck. Steam Cleaned, painted and adjusted in good serviceable condition. FOB Tulsa $6,210.00.

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DIVISION OF CABOT SHOPS, INC.
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36-L BUCYRUS-ERIE Drilling Machine. With casing strut, lines, dog house, tool box, light plant, blower and forge, butane tank—ready to work—with or without tools. Priced for immediate sale, located in our Tulsa yard. Degen Pipe & Supply, Tulsa.

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3—IR Starting Air Compressors, Model 25c, Type 40, 265#, 67.6 cfm.

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1—7'6" x 65'6", 30 trays, 45# psi.
1—7' x 25'6", 10 trays, 347 SS, 50# psi.
1—6' x 58' x ½" Shell Chrome-lined, 21 Trays, New 1951.
1—6'6" x 65' x ⅝" Shell, 17 Chrome Decks, 9 Chrome Baffles.
1—6' x 27', 14 trays.
1—5' x 27' x ¾" Shell, 10 Trays.
1—3'6" x 49' x ⅞" Shell, 28 Trays, 180#.
1—30" x 34'10" x ¼" Shell, 18 Trays.
4—3' x 50', 3' x 35', 3'6" x 28', Packed Towers.

TANKS - VESSELS

6—1250, 1,000 Bbl. Welded and Bolted Tanks.
10—8' x 15', 10' x 20', 6' x 20', 5'3" x 38'6", (Ch. Lin. 90#), 3'10" x 38', (325# 950° F.), 7' x 15', 5' x 18'.

HEAT EXCHANGERS

3—Kellogg 2400 sq. ft. Admiralty Tube, 150# psi.
1—Efco Steel Tube 1500 sq. ft., 150# psi.
2—Alco Steel Tube, 850 sq. ft. 800#, 800° F.
1—Griscom Russell Admiralty Tube, 742 sq. ft., 150# psi.
3—Struthers-Wells Admiralty Tube 425 sq. ft., 150# psi.

ATMOSPHERIC HEAT EXCHANGERS

8—715 sq. ft., 850 psig, 550° F., S.S.
6—470 sq. ft. 850 psig, 550° F., S.S.
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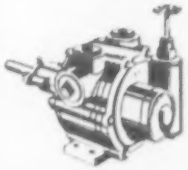

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MUST SACRIFICE one rotary rig, consisting of: Union Drawworks, with all air operated friction clutches. Three 145 h.p. Cummins Diesel engines, compounded. One 7¼"x14" Wheeling mud pump. One A-frame, doubles, reinforced mast and superstructure. One 17½" Oil Well turntable. One doghouse. One fuel tank. One water tank. One light plant. One water pump. Catwalk, pipe racks, and steps. Five drill collars. Contact M. Worthington, Box 606, Holdenville, Oklahoma, or phone 723.

FOR SALE. 1—Beaird—Ingersoll-Rand packaged Compressor Plant, Type 6-JVG (165 H.P.) Heavy-Duty, direct connected, 4-cycle, gas engine driven, single stage equipped with 3—4¼ x 9 compressor cylinders, three hand operated fixed volume pockets, two hand operated valve lifters, 20" O.D. 500# W.P. intake scrubber, air starting equipment and controls for automatic operation. Designed for intake pressure range 100# -250#, discharge pressure range 500# -600#. Delivery 3,480 MCF per day at 250# intake, 550# discharge. This plant has been in use less than 30 days and is located near Palestine, Texas. Box H-616, The Oil and Gas Journal, Tulsa, Oklahoma.

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ROTARY RIG complete ready to work, 3000 foot capacity. Please state price, location, make of components, condition and include inventory in first letter. Tools must be in A-1. Box H-939, The Oil and Gas Journal, Tulsa, Oklahoma.

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QUOTE BEST PRICE AND LOCALITY.
BOX H-937,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

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WANTED: Petroleum or Mechanical Engineer for designing oil field equipment. Excellent working conditions, Forty-hour week. Located in Dallas, Texas. Two years actual field experience desirable. Please give age, experience, education and salary expected. Box H-911, The Oil and Gas Journal, Tulsa, Oklahoma.

RESEARCH ENGINEER

Major oil company has opening in production research for a man with petroleum engineering and or geological background. Work involves research on core-analysis methods, fluid flow, and related petroleum reservoir studies. Location, midwest. Applicant should supply complete resume of education, experience, qualifications, references and salary expected. All replies confidential.

Box H-926,
The Oil and Gas Journal,
Tulsa, Oklahoma

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(Supervisory)

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Salary commensurate with training and work experience. Write giving full particulars regarding personal history and work experience. Please include telephone number.

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EXPANDING INDEPENDENT Oil Company wants young geologist experienced in mapping and electric log interpretation (1 to 3 years experience). We want ideas for future drilling. Reply giving age, experience, and salary expected. Box H-904, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED—Seismologist by independent oil firm. Permanent location in Dallas. Give full education, employment history, and minimum salary in initial letter of application. Reply Box H-895, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMICAL OR MECHANICAL Engineer, recent graduate, for modern mid-west refinery. Excellent opportunity for permanent employee. Send complete data with original application. Box H-907, The Oil and Gas Journal, Tulsa, Oklahoma.

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Must have degree in chemical engineering; minimum of five years experience in petroleum refinery design; capable of evaluating refinery operations and data, preparation of process calculations, process flow diagram and equipment specifications. Follow through on mechanical design of facilities. Will be expected to make independent analyses and exercise individual judgment. Please write to Chief Design Engineer and give full details of personal history and work experience. Provide references and include photograph.

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A SOCONY MOBIL COMPANY
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Attractive salaries, liberal annuity and savings program offered.

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ATTRACTIVE OPPORTUNITY for Process-Project Engineer with substantial Independent Gasoline Plant company in Gulf Coast Area with minimum 4-5 years experience in gasoline plant processing, design and economic studies. Experience with modern refinery processing, design and economic studies desirable. Furnish complete resume of personal history, experience and qualification which will be treated confidentially. Box H-942, The Oil and Gas Journal, Tulsa, Oklahoma.

A YOUNG ENGINEER with knowledge of geology for office and field work. You will receive well completion and production experience with independent oil company located in Tulsa, Okla. Please state age, experience, education, references, and salary expected. Strictly confidential. Box H-884, The Oil and Gas Journal, Tulsa, Oklahoma.

SUBSURFACE GEOLOGIST: Exploration Company has immediate opening for subsurface geologist with 3 to 5 years experience, preferably in Oklahoma. Location in Tulsa. Mail resume including personal history, employment record, educational background and salary requirements to Apache Oil Corporation, 823 South Detroit, Tulsa. All replies confidential.

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Fast growing independent oil and gas firm, with over 300 producing wells in New Mexico, has opening in Dallas office also southeastern New Mexico. Minimum of 5 years experience. Give full education, employment history, and minimum salary in letter of application. Reply

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The Oil and Gas Journal,
Tulsa, Oklahoma

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YOUNG MAN with background in economics and marketing to do statistical and analytical work—independent oil refiner and marketer. Degree with major in marketing or economics essential. This presents good opportunity for right party. P. O. Box 3053, Dallas, Texas.

MECHANICAL ENGINEER

Pipeline construction equipment manufacturer in Southwest requires man for product development and design work. Write stating full qualifications and salary requirements. All replies confidential.

Box H-896, The Oil and Gas Journal, Tulsa, Oklahoma.

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OIL INDUSTRY Employment Service. Tom Robinson, owner, 405 Tuloma Bldg., Tulsa, Oklahoma. Specializing in Engineers with oil-industry experience.

SEISMIC Party Chief for work in United States with degree in Geophysics, Geology or Engineering, age 26 to 35, capable of advancing in small progressive contract seismograph company. Must be good interpreter. Salary commensurate with ability. Please include education and complete brief of experience in first reply. Replies confidential. Box H-932, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

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GEOLOGIST—Geophysicist desires employment with active oil company in exploration department. 6 years experience including supervisory experience with contract geophysical firm. Box H-908, The Oil and Gas Journal, Tulsa, Oklahoma.

EXECUTIVE—39 years old, with fifteen years oil business experience—2 years Latin America and Middle East. Speaks five languages—has worldwide political and business connections, wife a lawyer. Would like administrative position with future. Excellent references. Write Box H-909, The Oil and Gas Journal, Tulsa, Oklahoma.

YOUNG EXECUTIVE familiar with exploration, drilling and producing desires employment with active company. At present with independent. Salary and location open. Box H-899, The Oil and Gas Journal, Tulsa, Oklahoma.

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PETROLEUM ENGINEER, 30, 6 yrs. drilling, production, administrative and evaluation experience in California oilfields. Desires position with aggressive independent or small expanding California organization. Phone DIckens 33880, Los Angeles or Box H-923, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER, 10 years diversified production and management experience with major company and independent operators. Available for supervisory position with active organization. Box H-925, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST, four years major company experience, exploration and development Great Basin and California. Graduate work 28, married, prefer independent or small integrated company. Box H-924, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

RESERVOIR ENGINEER—M.S. Degree and 4 years experience with major company in Secondary Recovery and Primary Development Programs desires position with advancement. Box H-941, The Oil and Gas Journal, Tulsa, Oklahoma.

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5 YEARS extensive experience in Latin Amer. Geology. BS Geology. 30 yrs. old, married, no children. Desires more Latin American work.

BOX H-938,
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TULSA, OKLAHOMA.

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EXECUTIVE. Administrative Petroleum Geologist desires exclusive retainer agreement with group interested in buying proven oil and gas properties, drilling deals, leases, etc., or will aid in forming oil company in exchange for executive position and stock bonus. Box H-914, The Oil and Gas Journal, Tulsa, Oklahoma.

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LEGAL

SEALED BIDS FOR SALE OF OIL AND GAS ROYALTY INTERESTS on the Crow Indian Reservation, Montana, will be received in the Office of the Superintendent, Crow Agency, Montana, until 2:00 O'Clock (M.S.T.), WEDNESDAY AUGUST 10, 1955 at which time they will be opened and publicly read. Six (6) Units consisting of 80 and 120-acre tracts now under Oil and Gas Leases are involved. Sale of a "one-half (1/2) of a one-eighth (1/8)" interest in the Royalties in each case by individual allottees owning such mineral interest is being made. For further detailed information and a list of the lands and interests advertised call or write: L. C. Lippert, Supt., Crow Indian Agency, Crow Agency, Montana.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Santa Fe, New Mexico. Notice is hereby given that approximately 4,004.54 acres of land in fifteen parcels within the known geologic structures of certain fields in Lea, Rio Arriba and San Juan Counties, New Mexico, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre at 2:00 P.M., MST, July 28, 1955, when bids will be opened. Details of the lease offering, how and where to submit bids, may be obtained from the Bureau's Land Office at Santa Fe, New Mexico. J. A. DeLany, Manager.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Land Office, Cheyenne, Wyoming. Notice is hereby given that approximately 124.90 acres of land in one parcel within the known geologic structure of the Hiawatha Field, Sweetwater County, Wyoming, are offered for oil and gas leasing through sealed bid to the qualified bidder of the highest amount per acre at 2:00 P.M., MST, August 26, 1955, when bids will be opened. Details of the lease offering and how and where to submit bids may be obtained from the Land Office at Cheyenne, Wyoming. Edward Gillette, Acting Manager.

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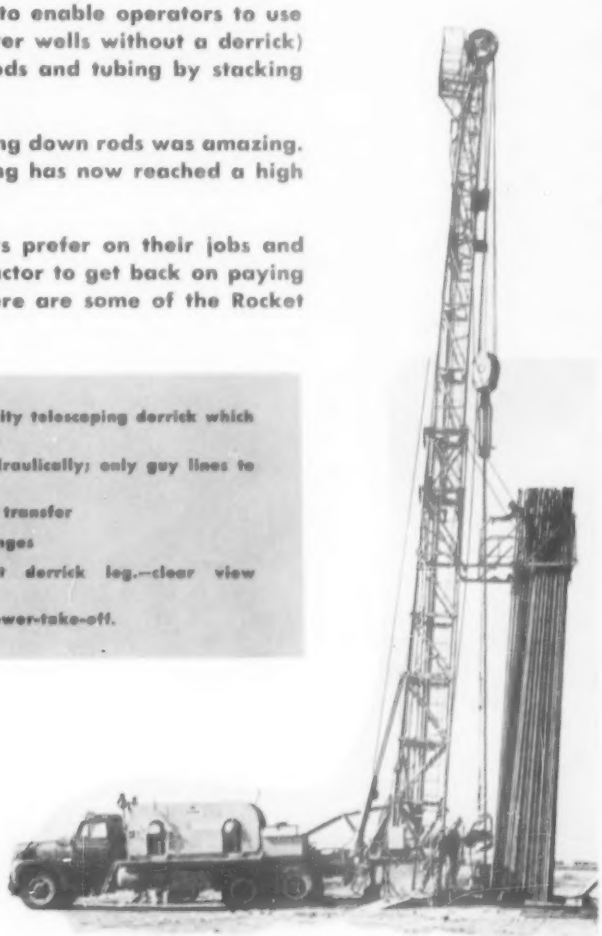

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